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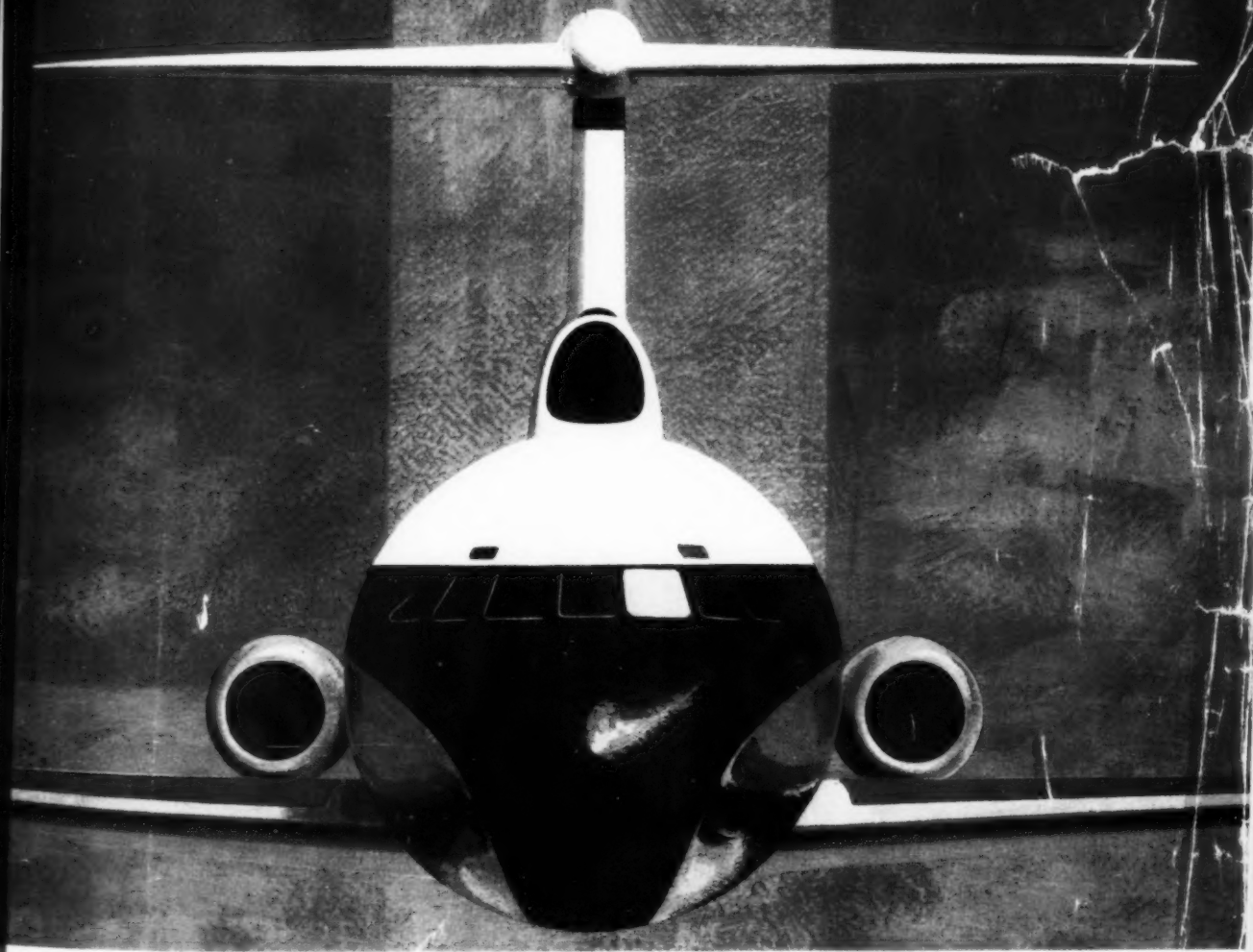

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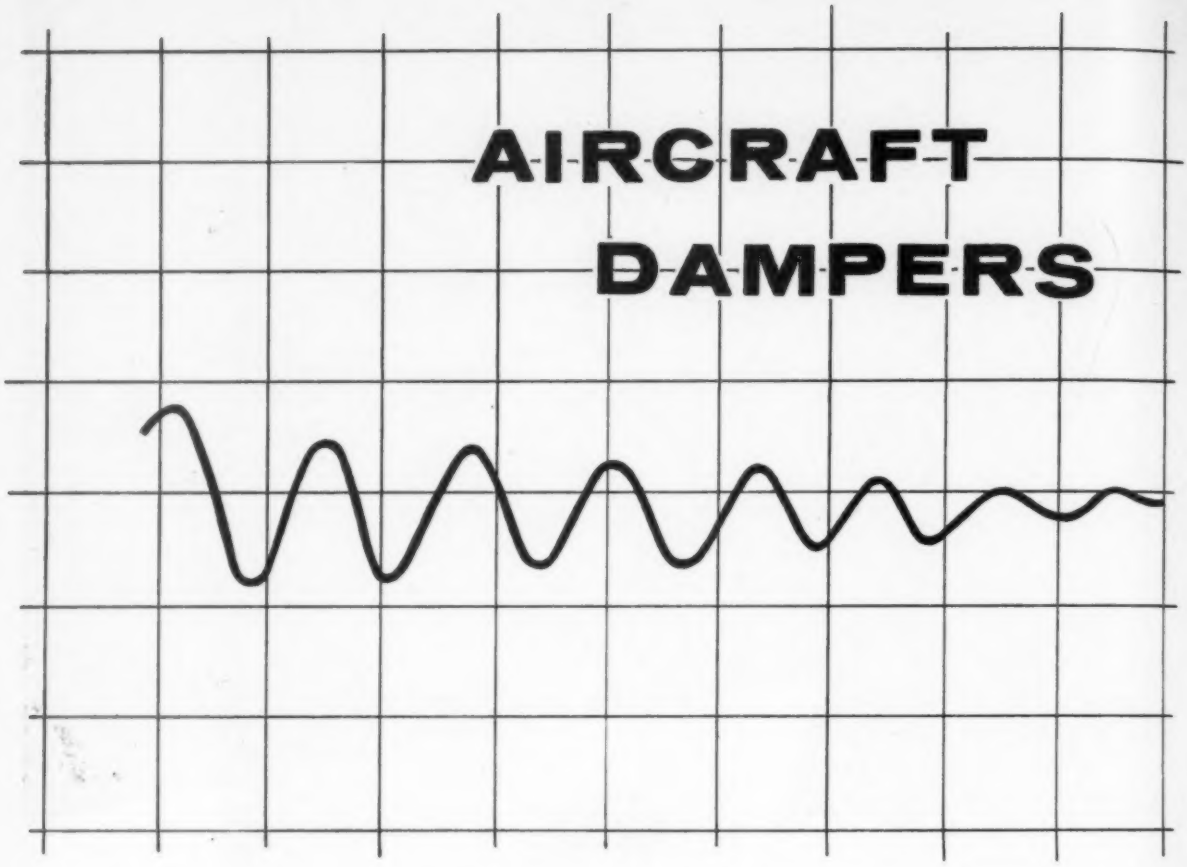

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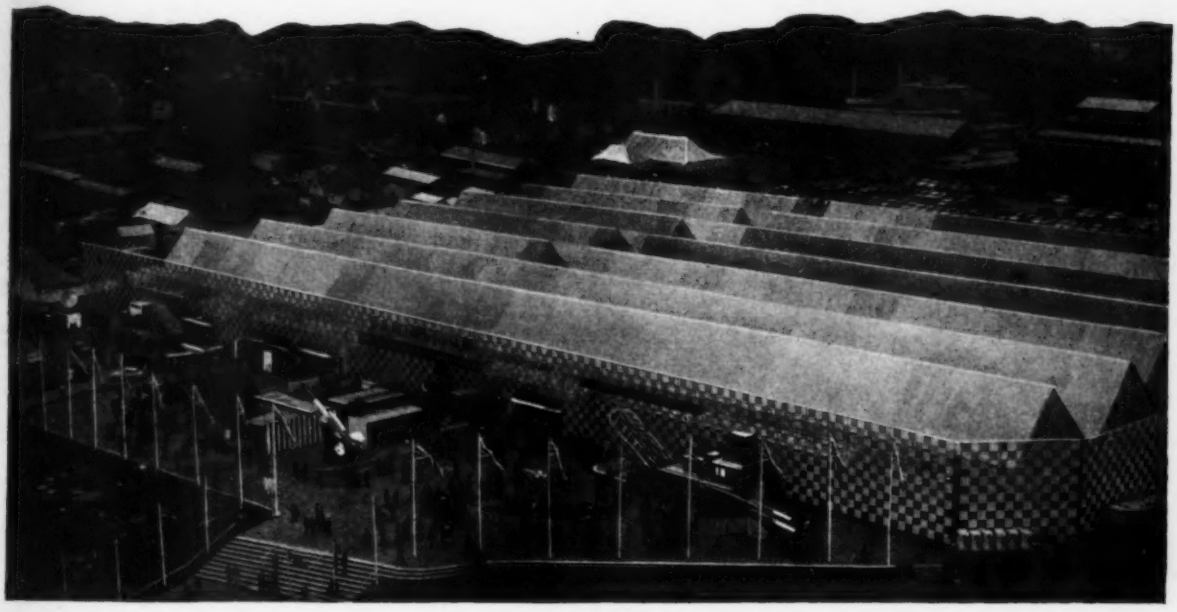

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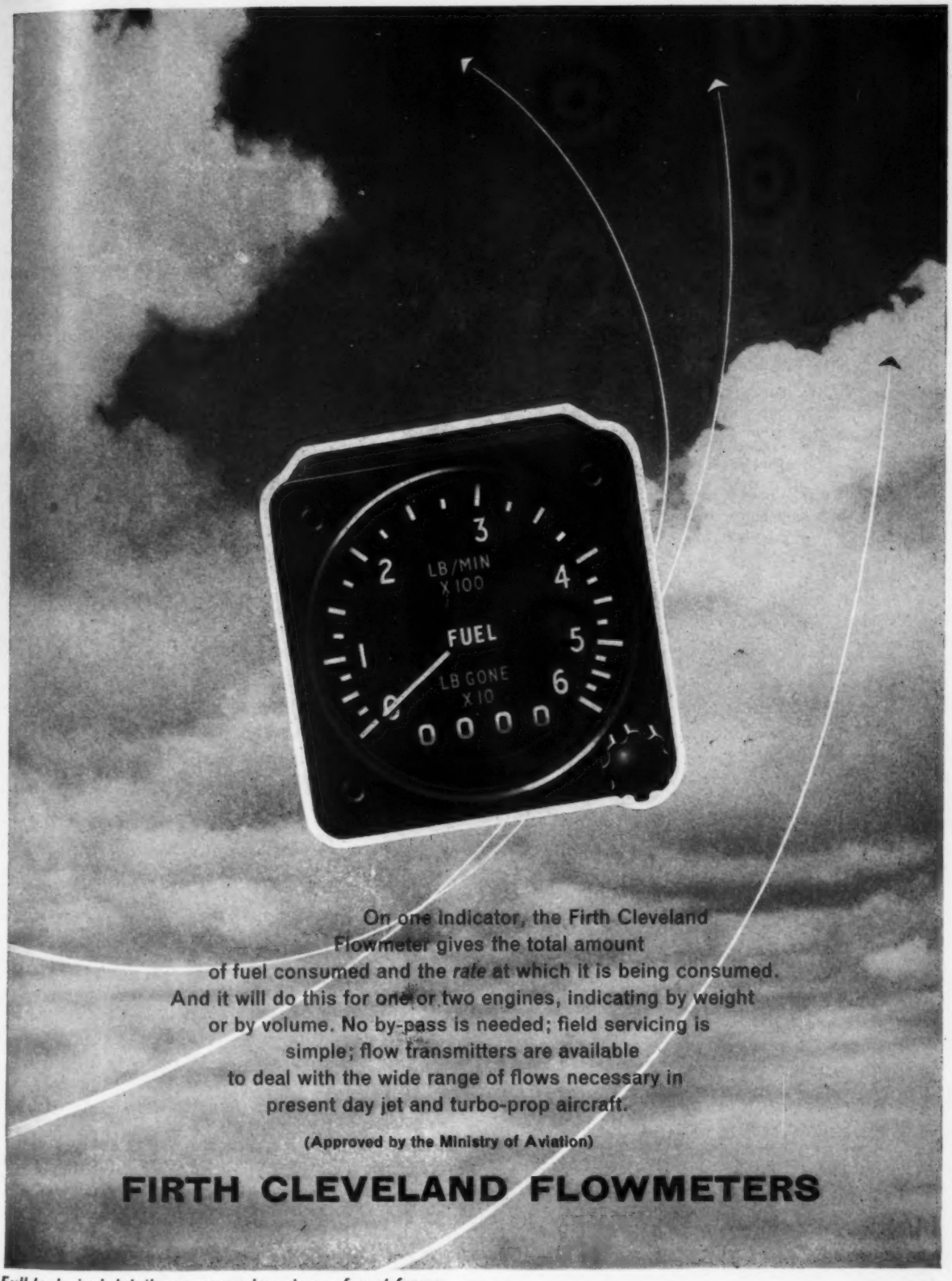

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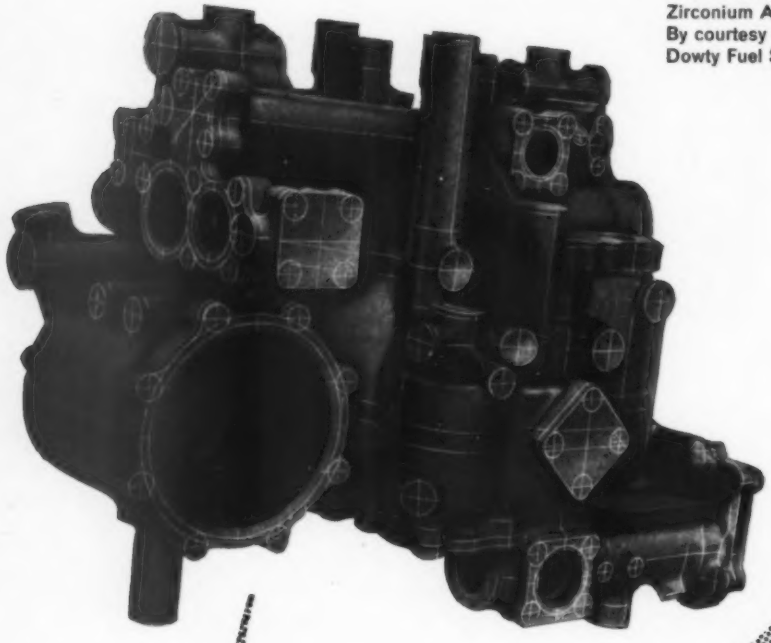

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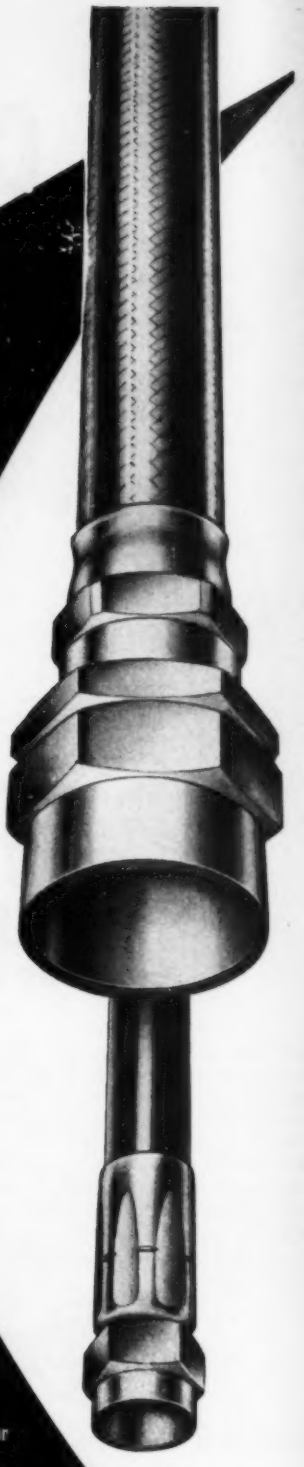

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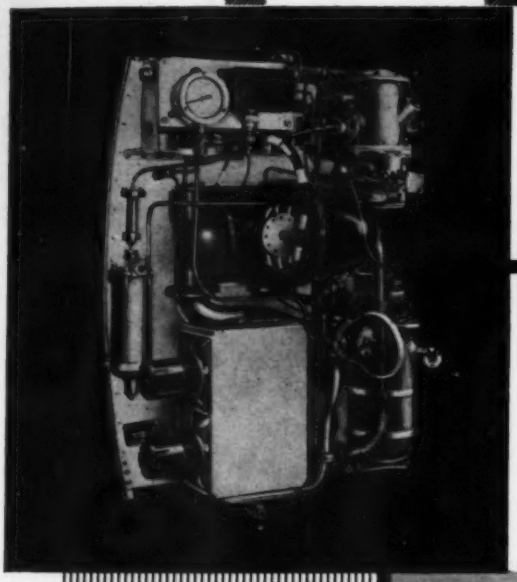

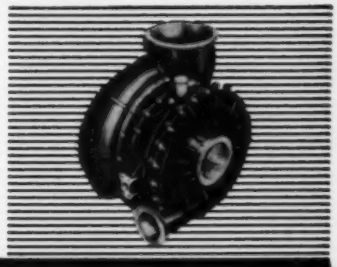

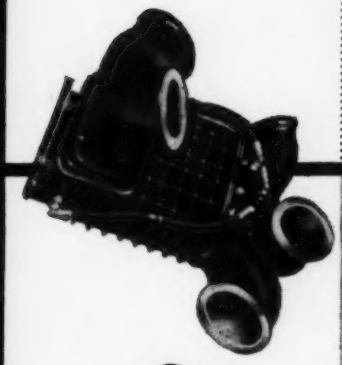

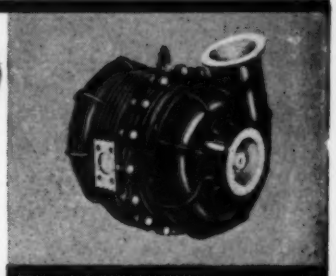

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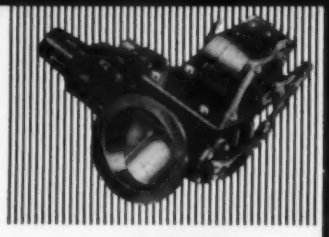

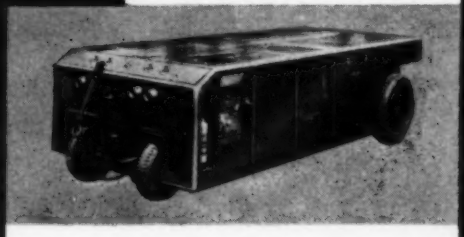

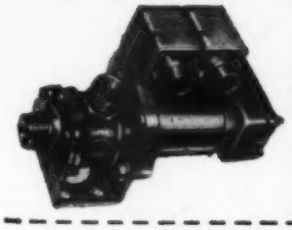

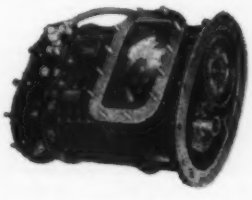

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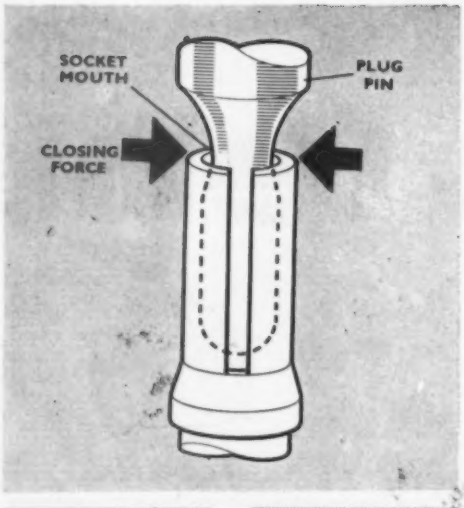

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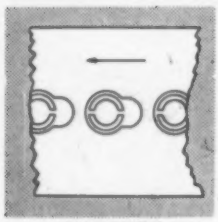

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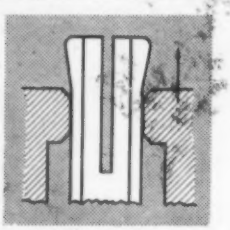

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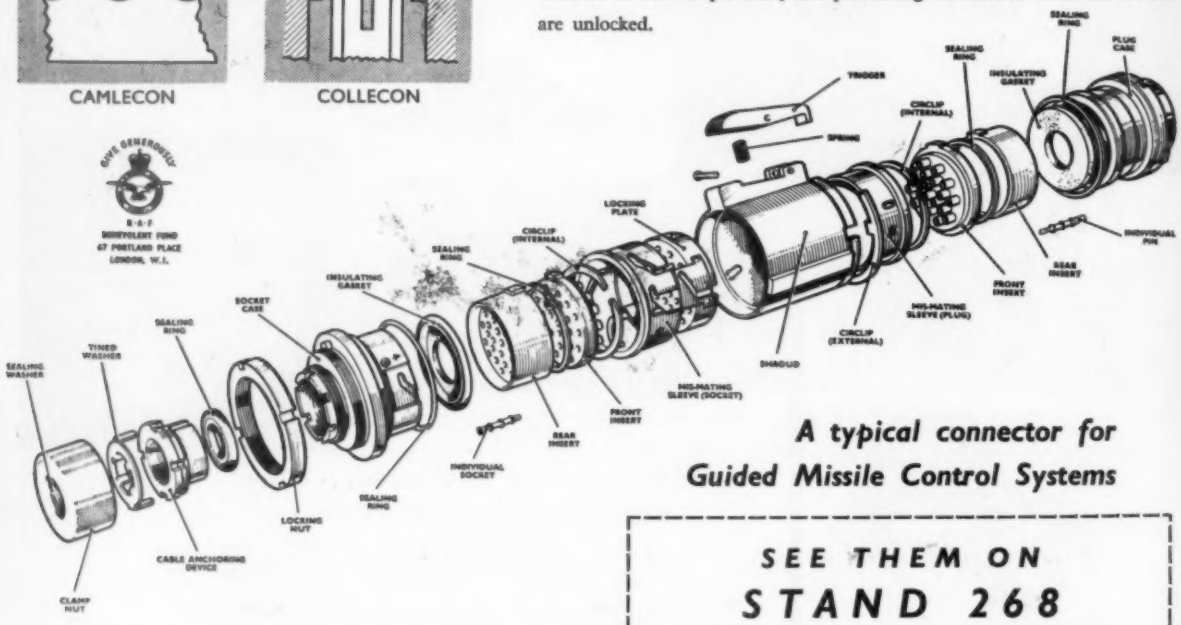

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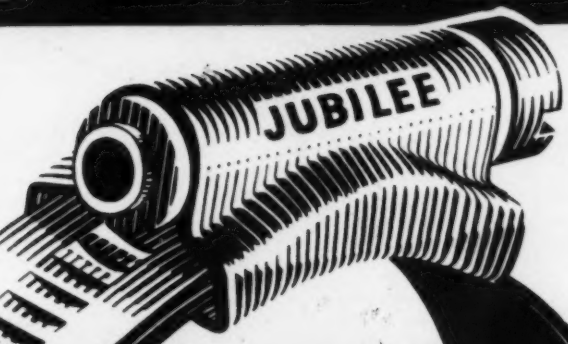

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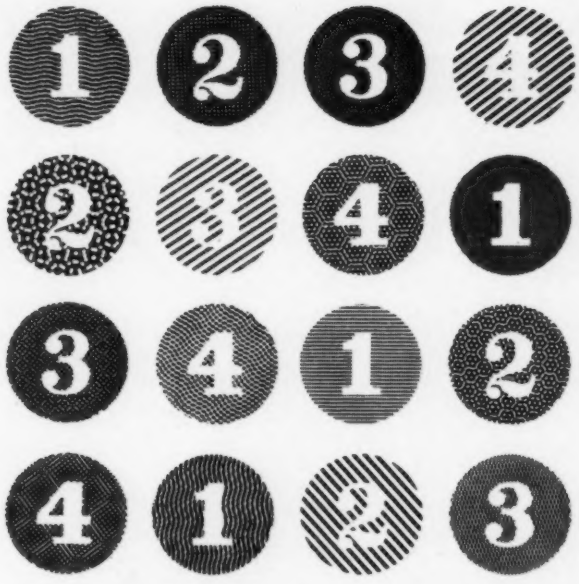

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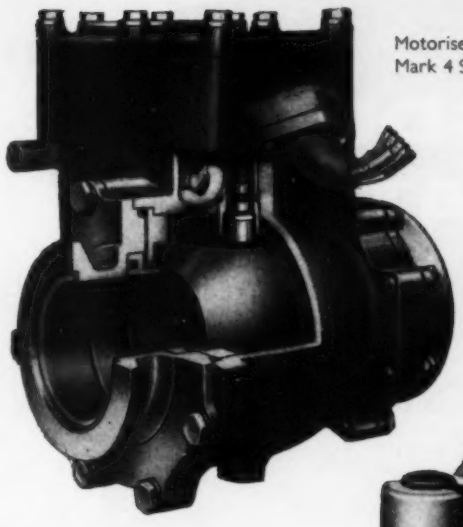

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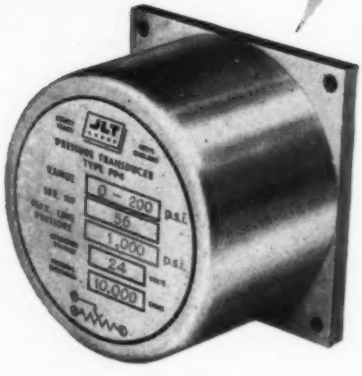

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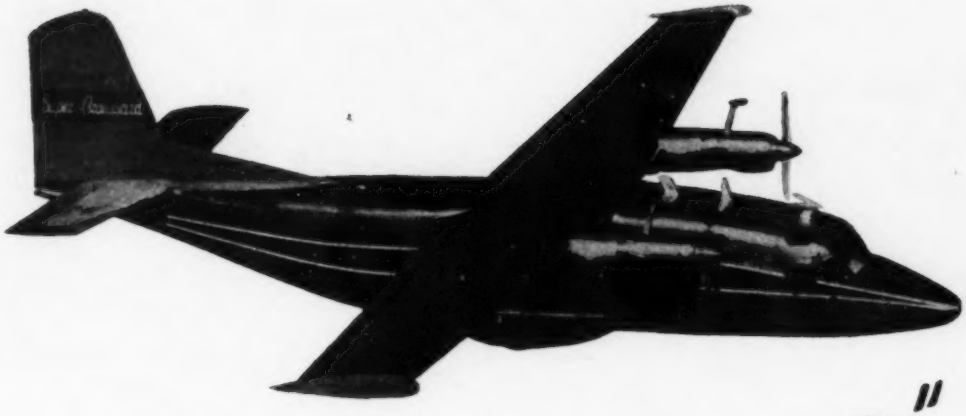

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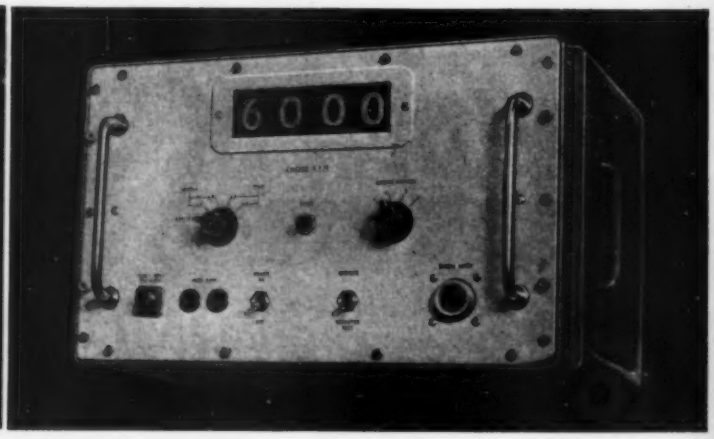

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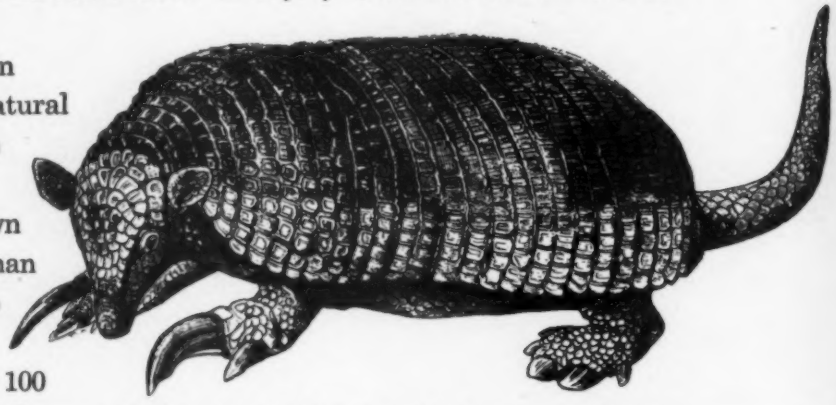

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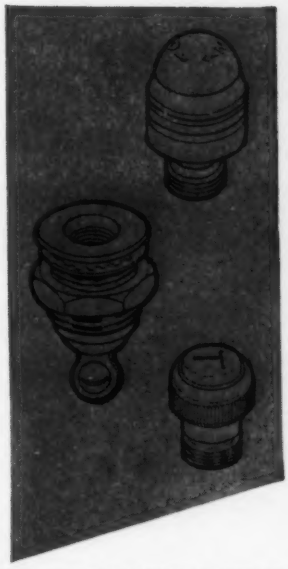

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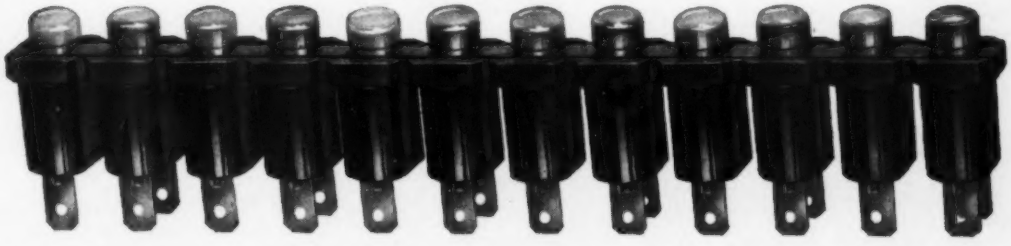

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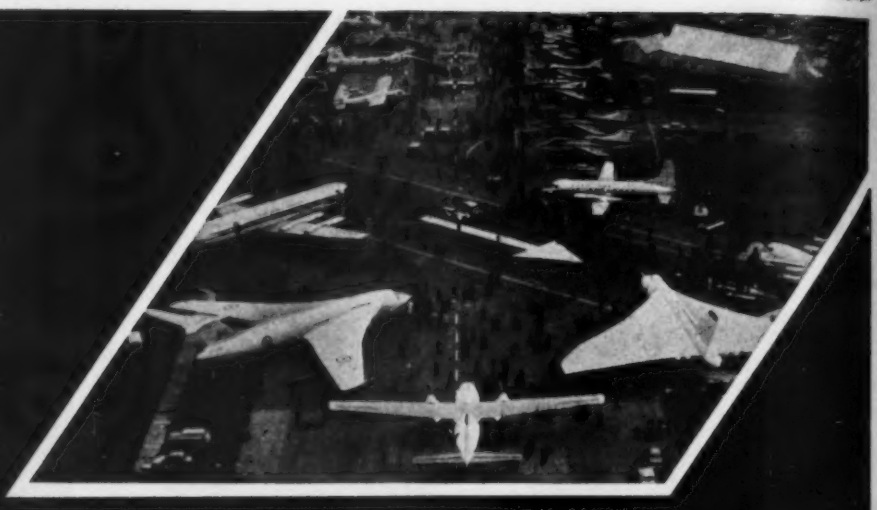

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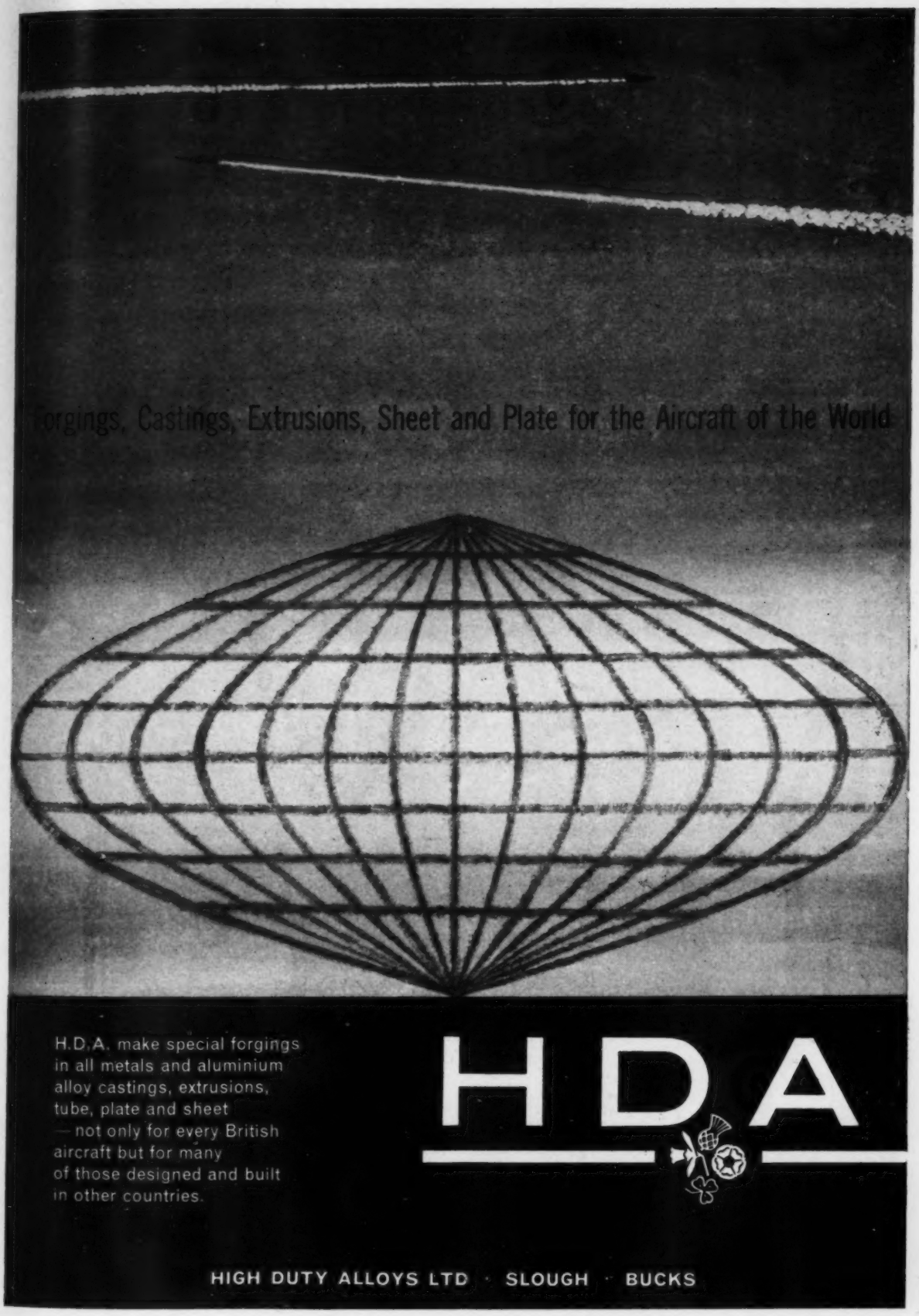
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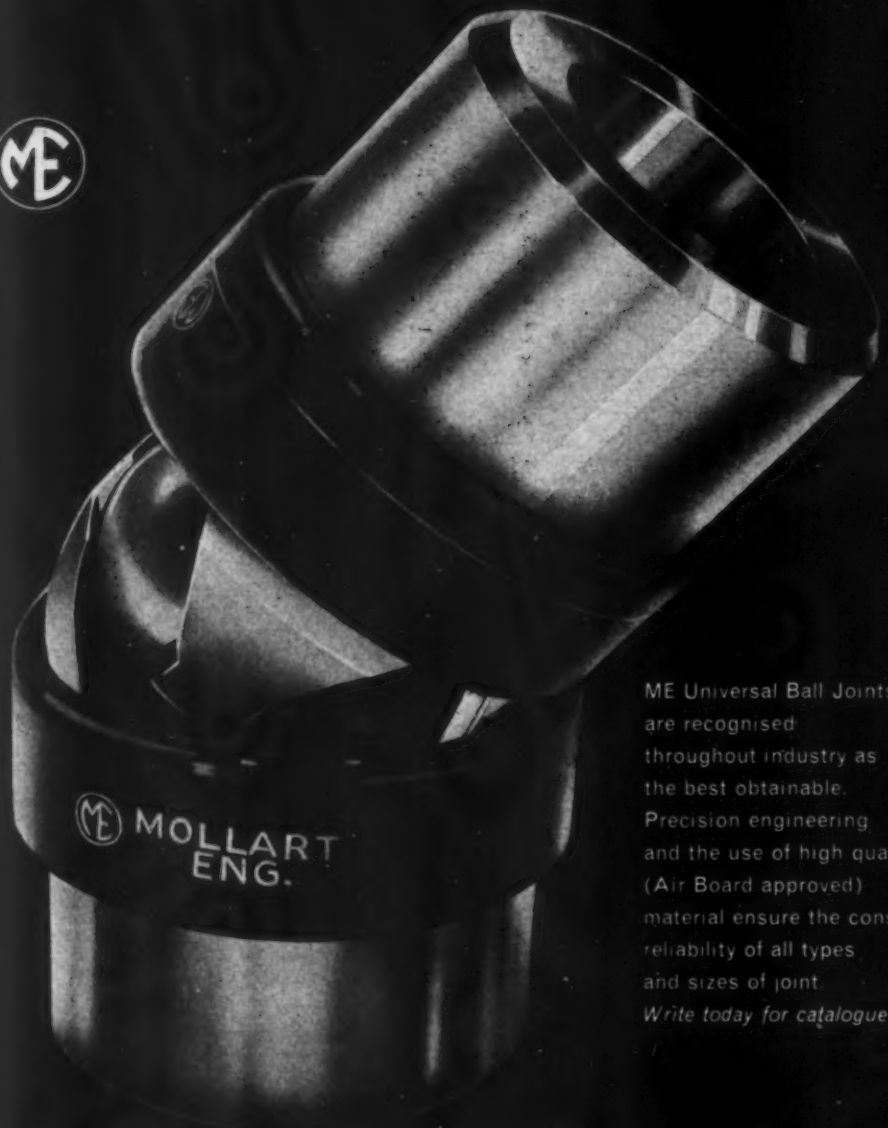

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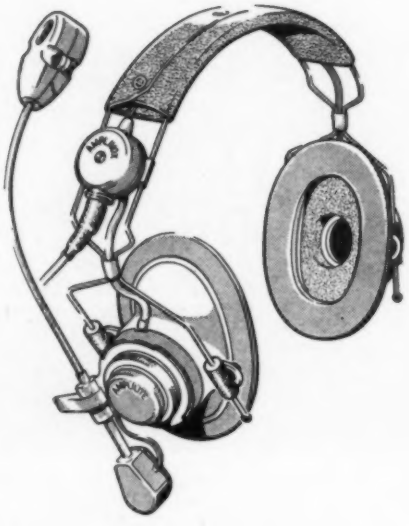

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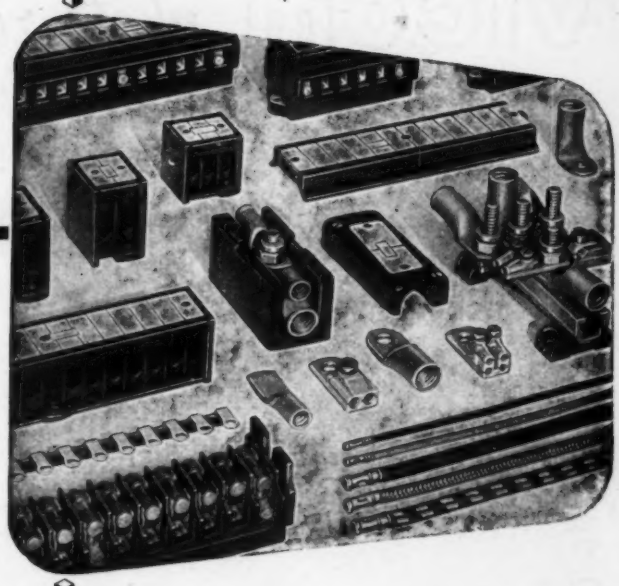

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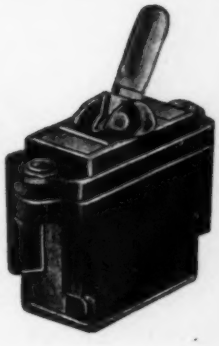

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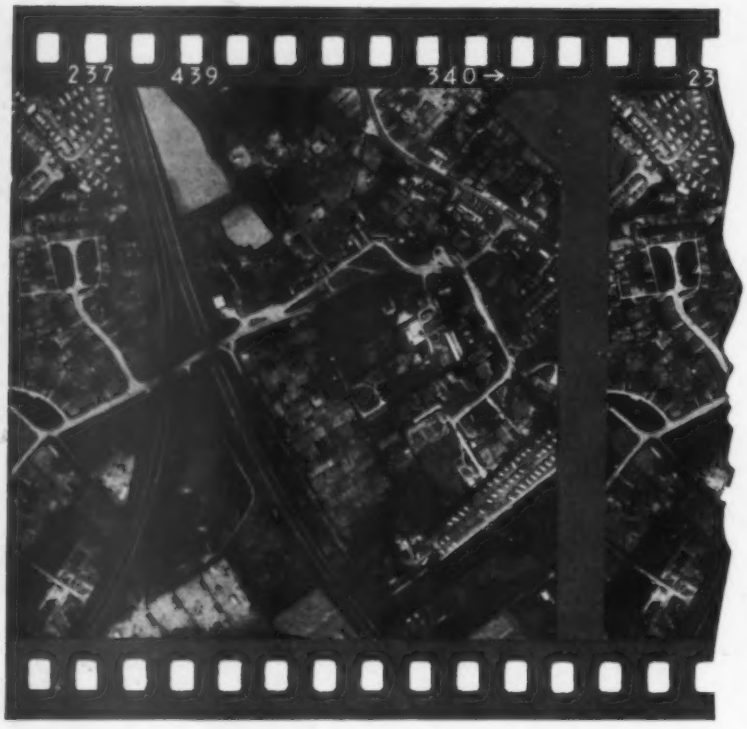

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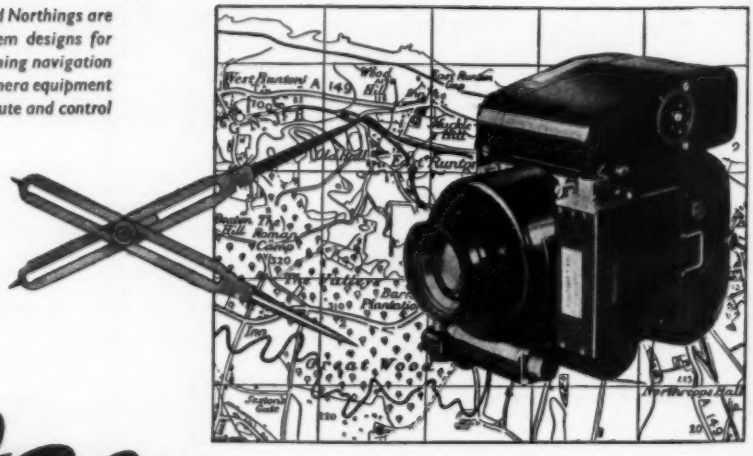

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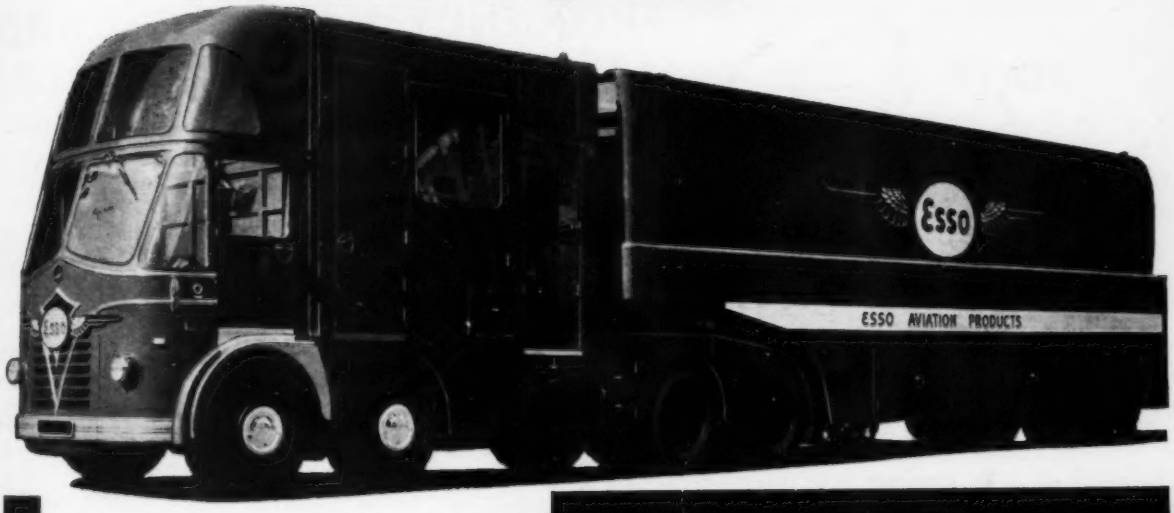

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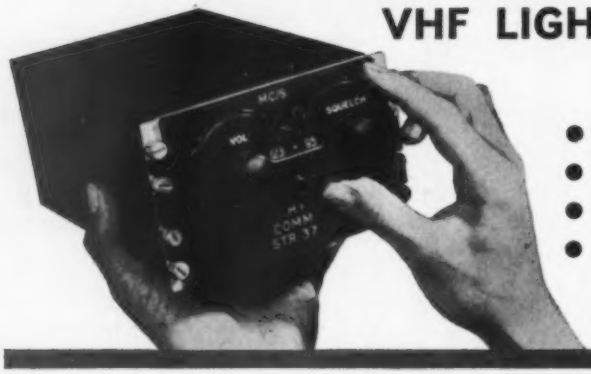

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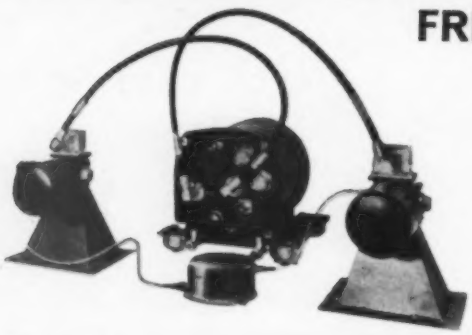

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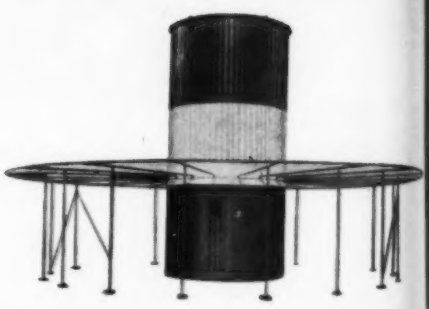

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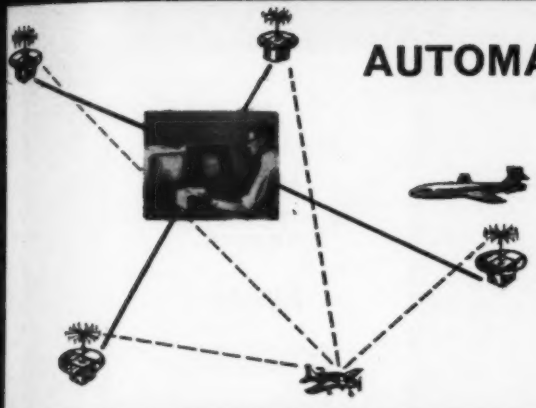
and world aviation



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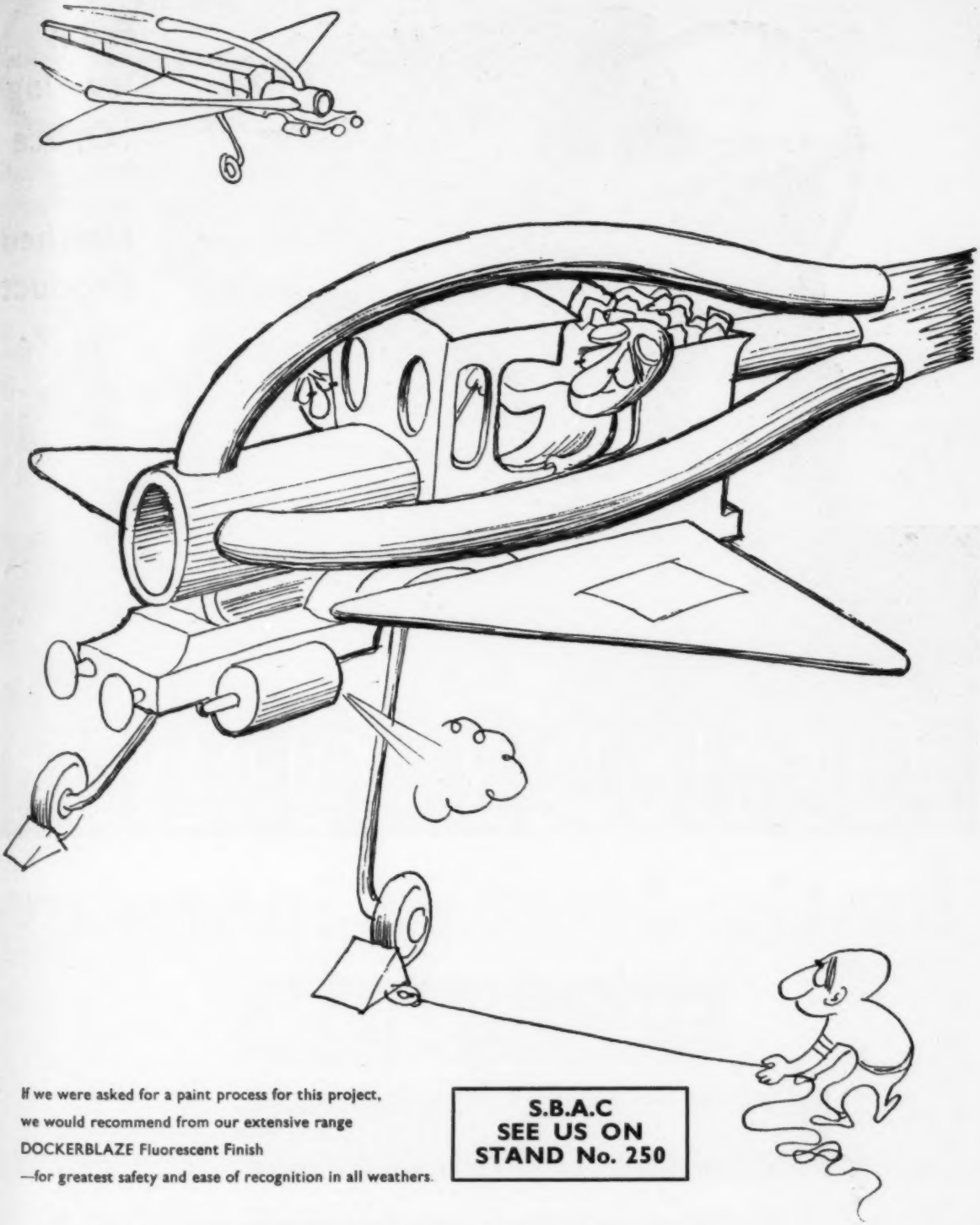

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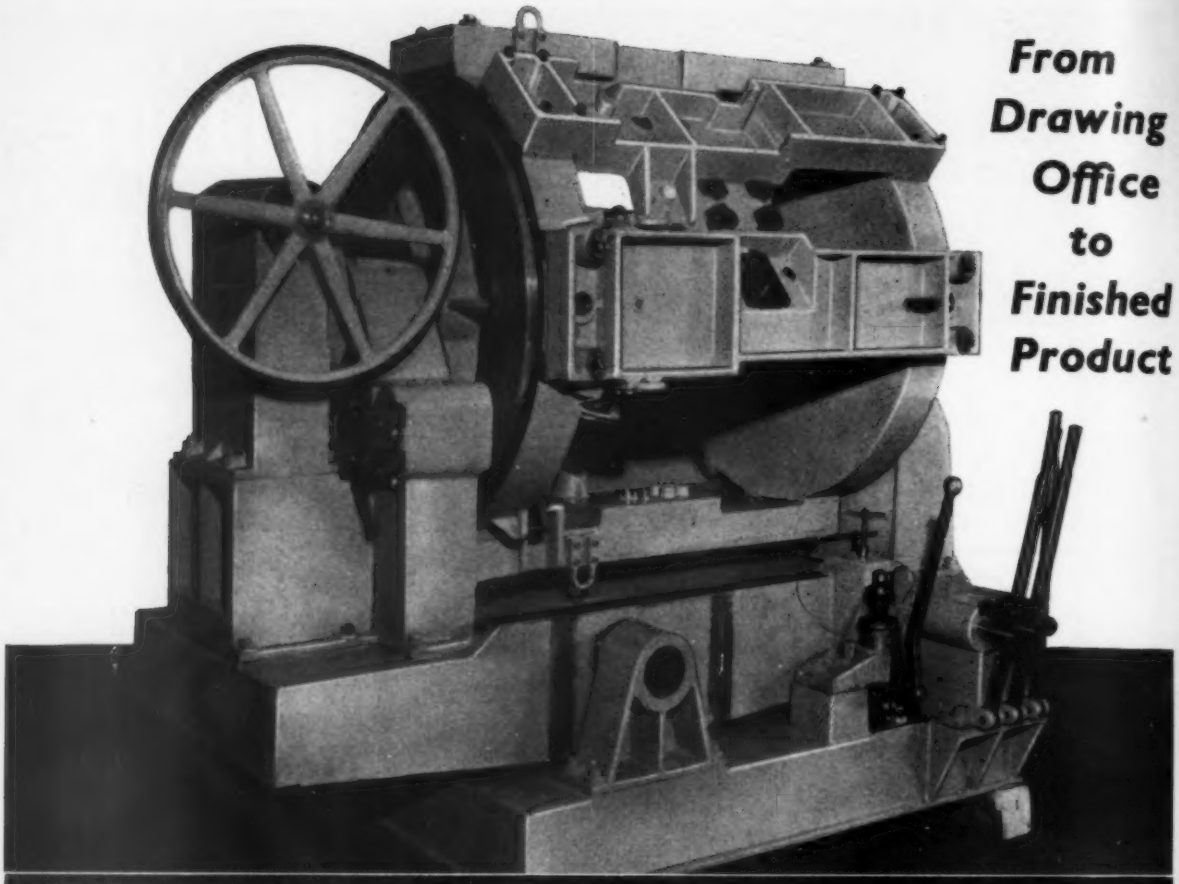

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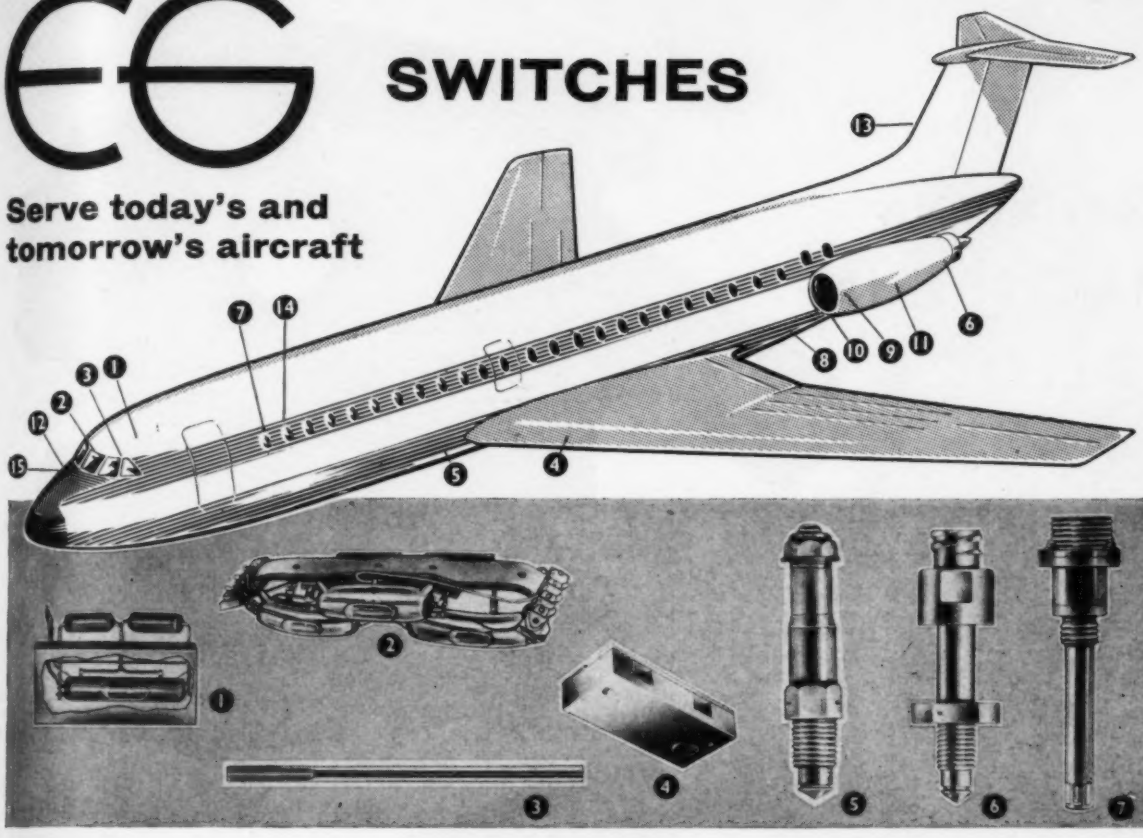

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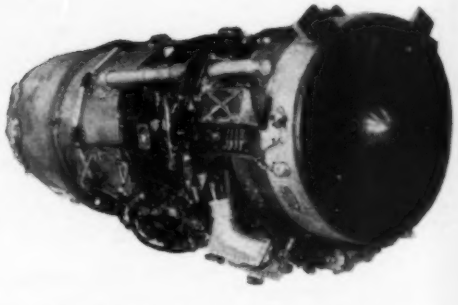

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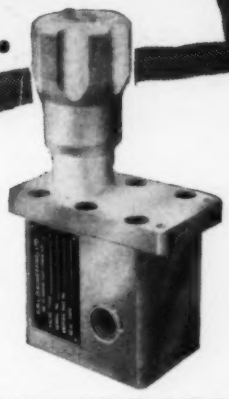

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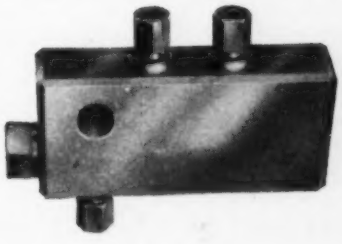

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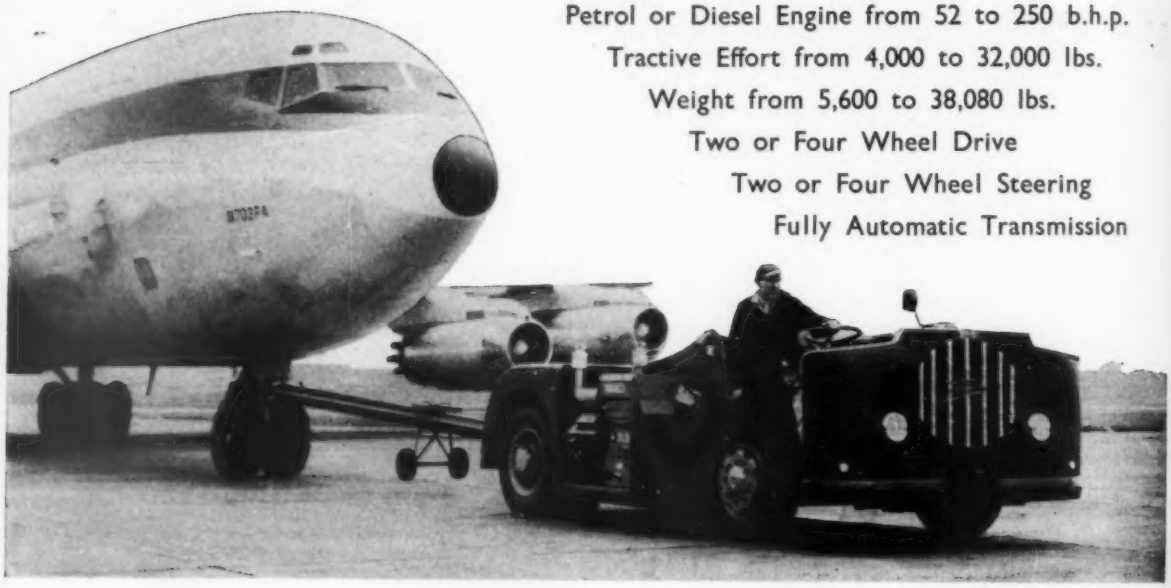

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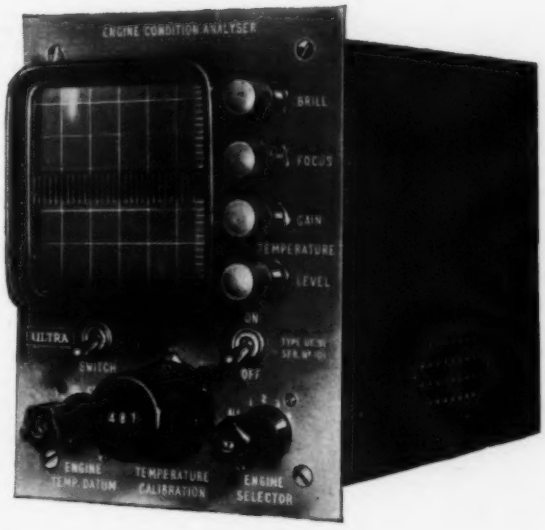

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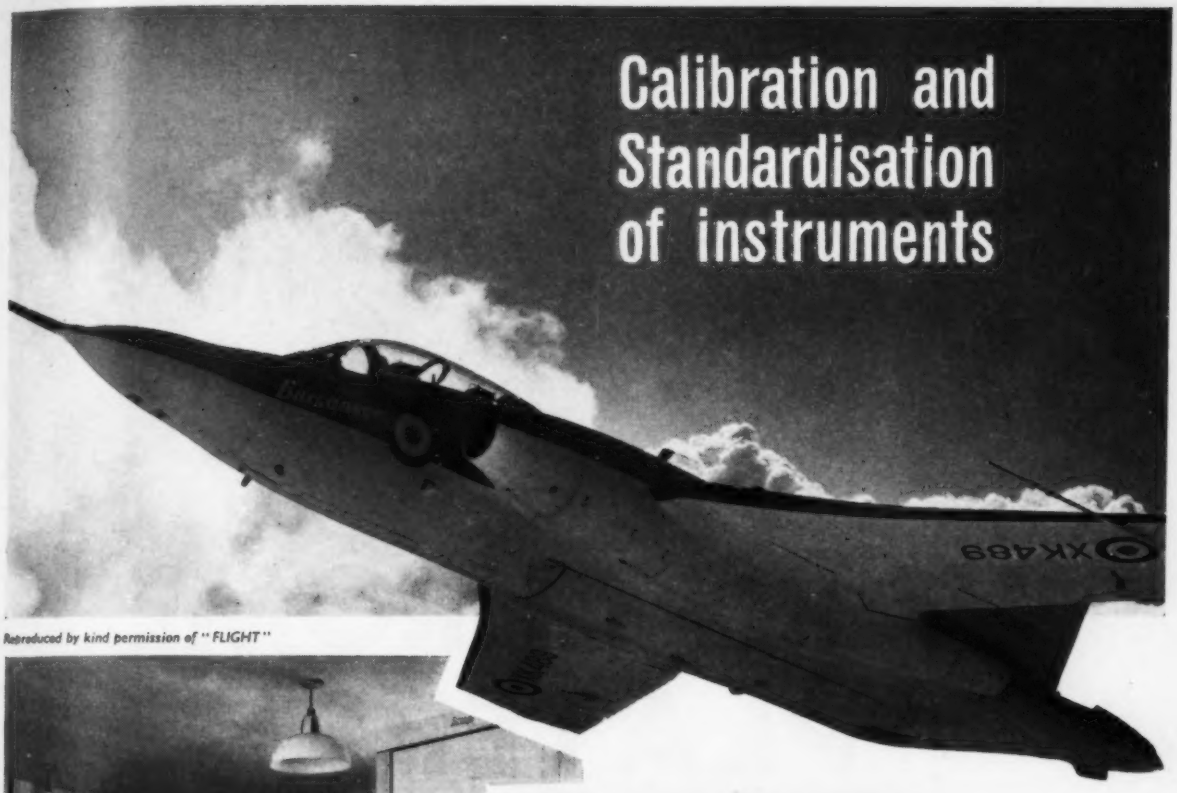

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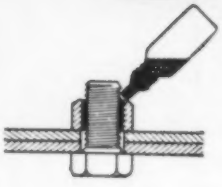

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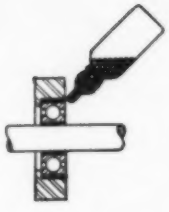

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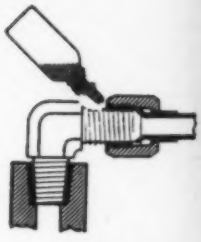

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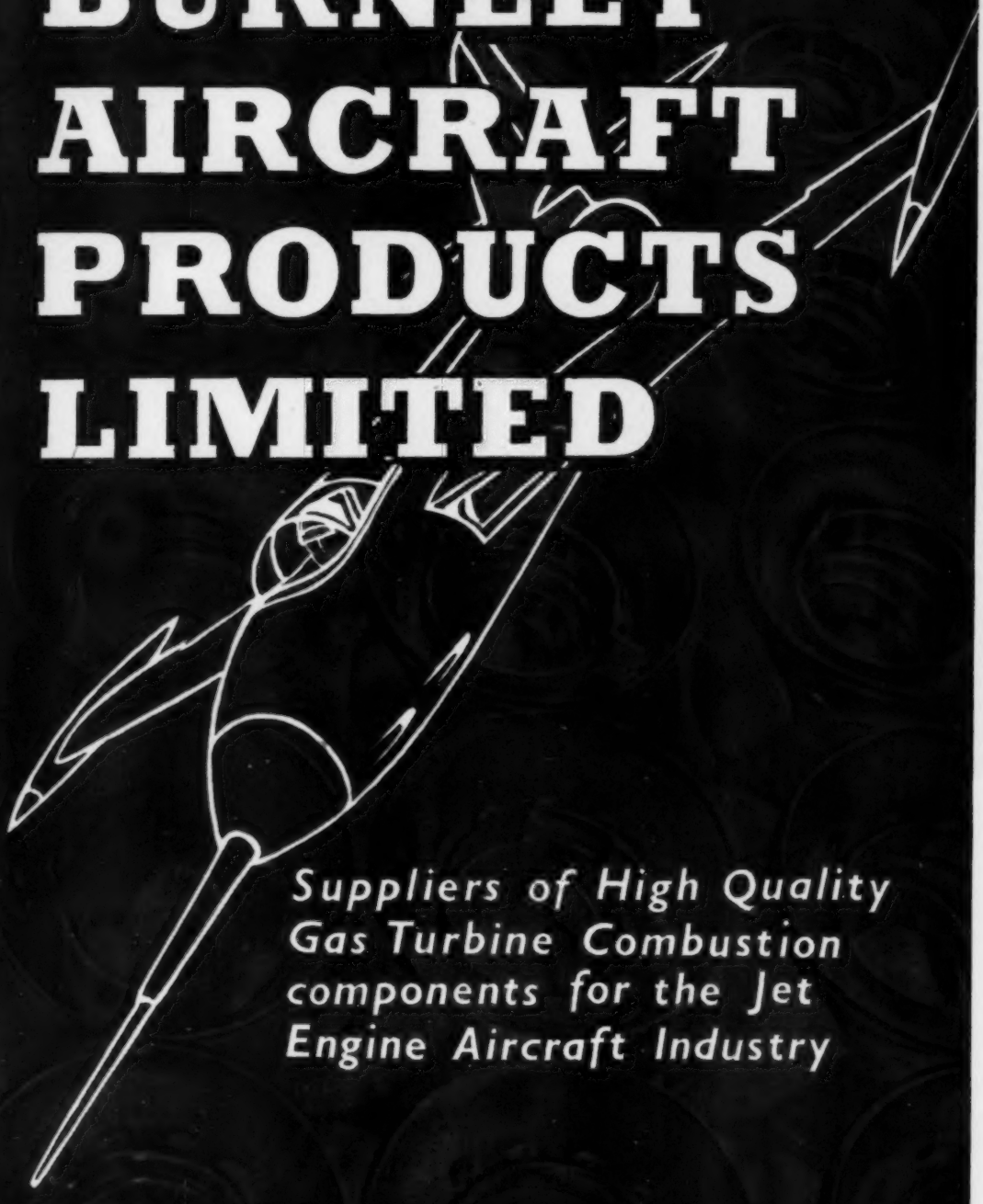

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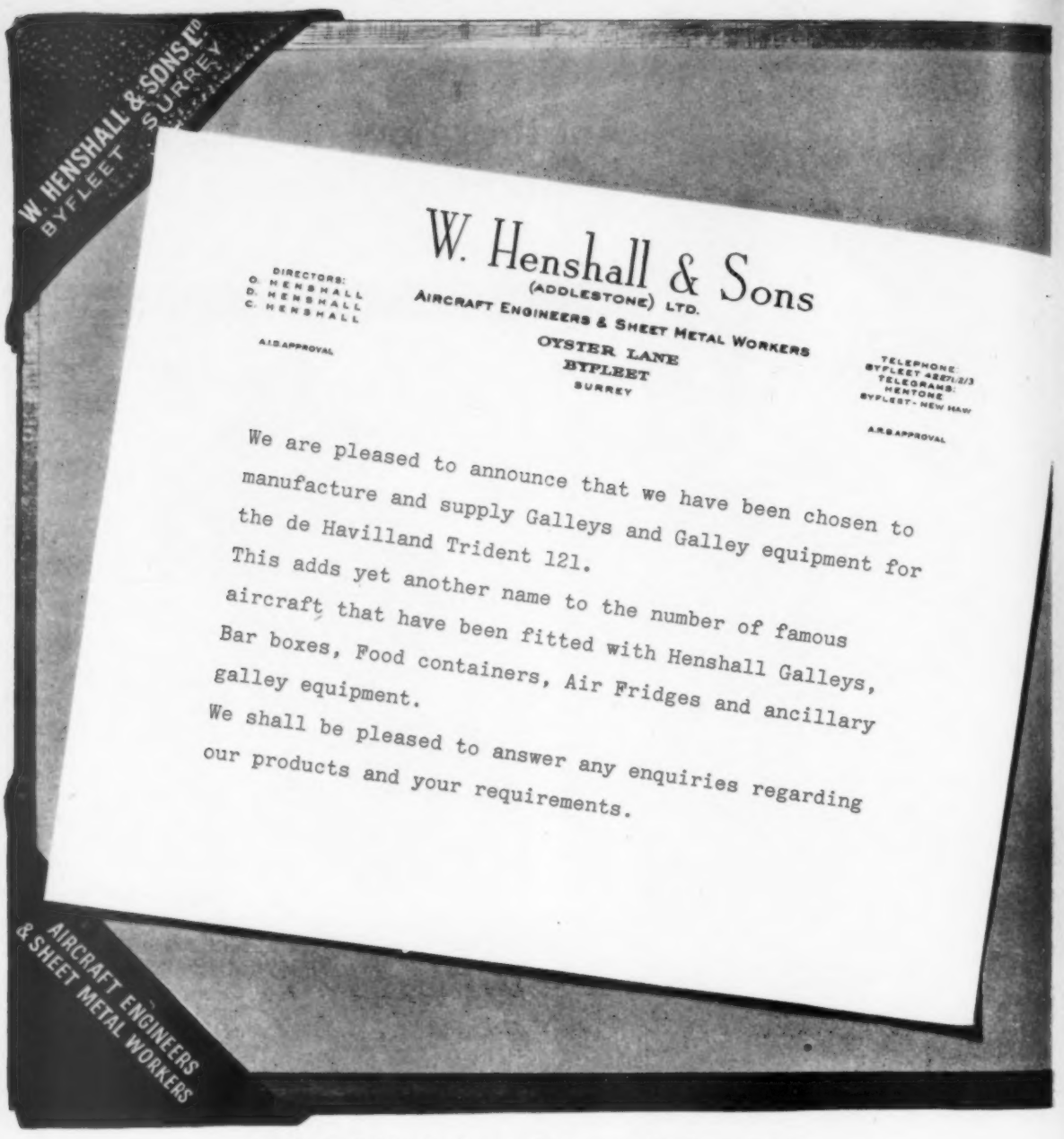
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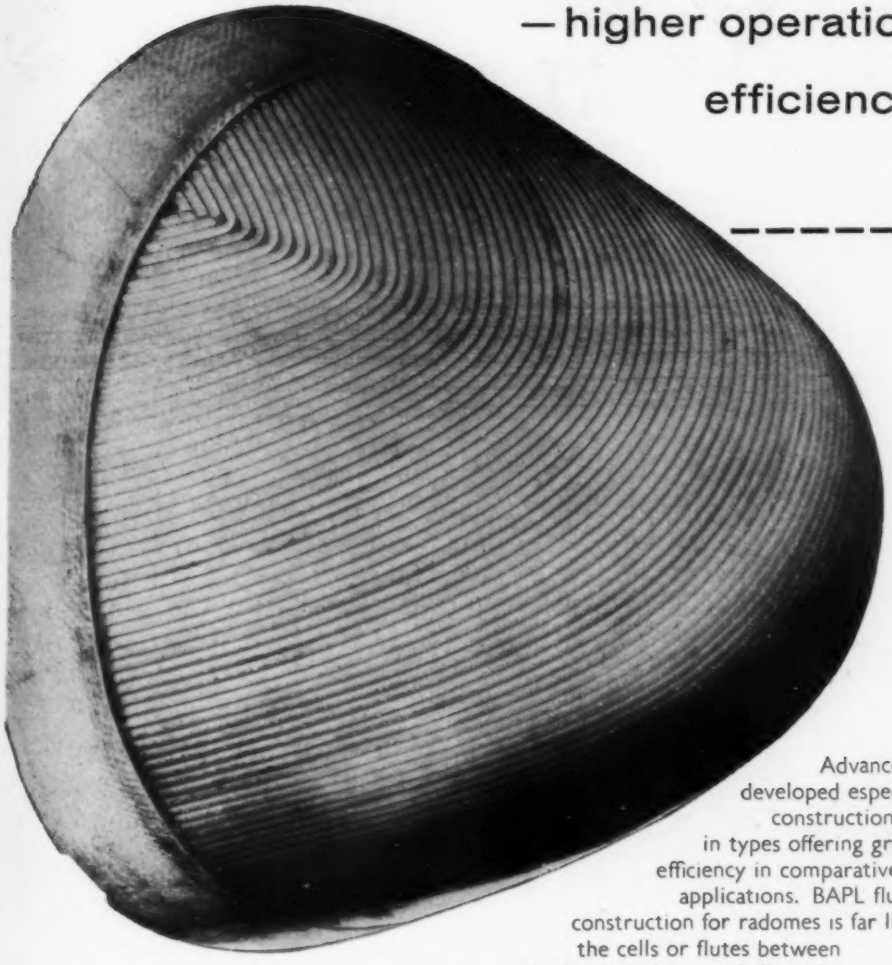

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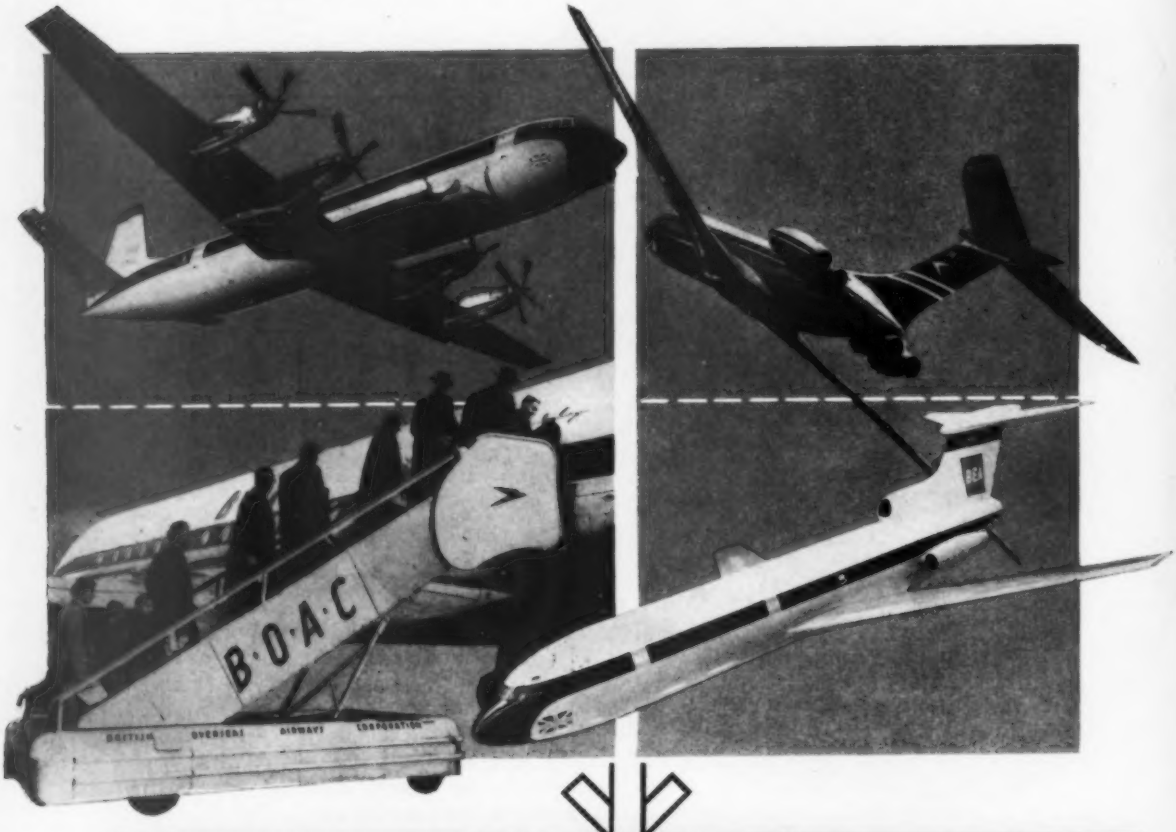

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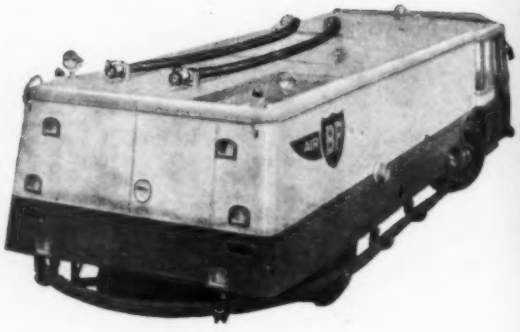

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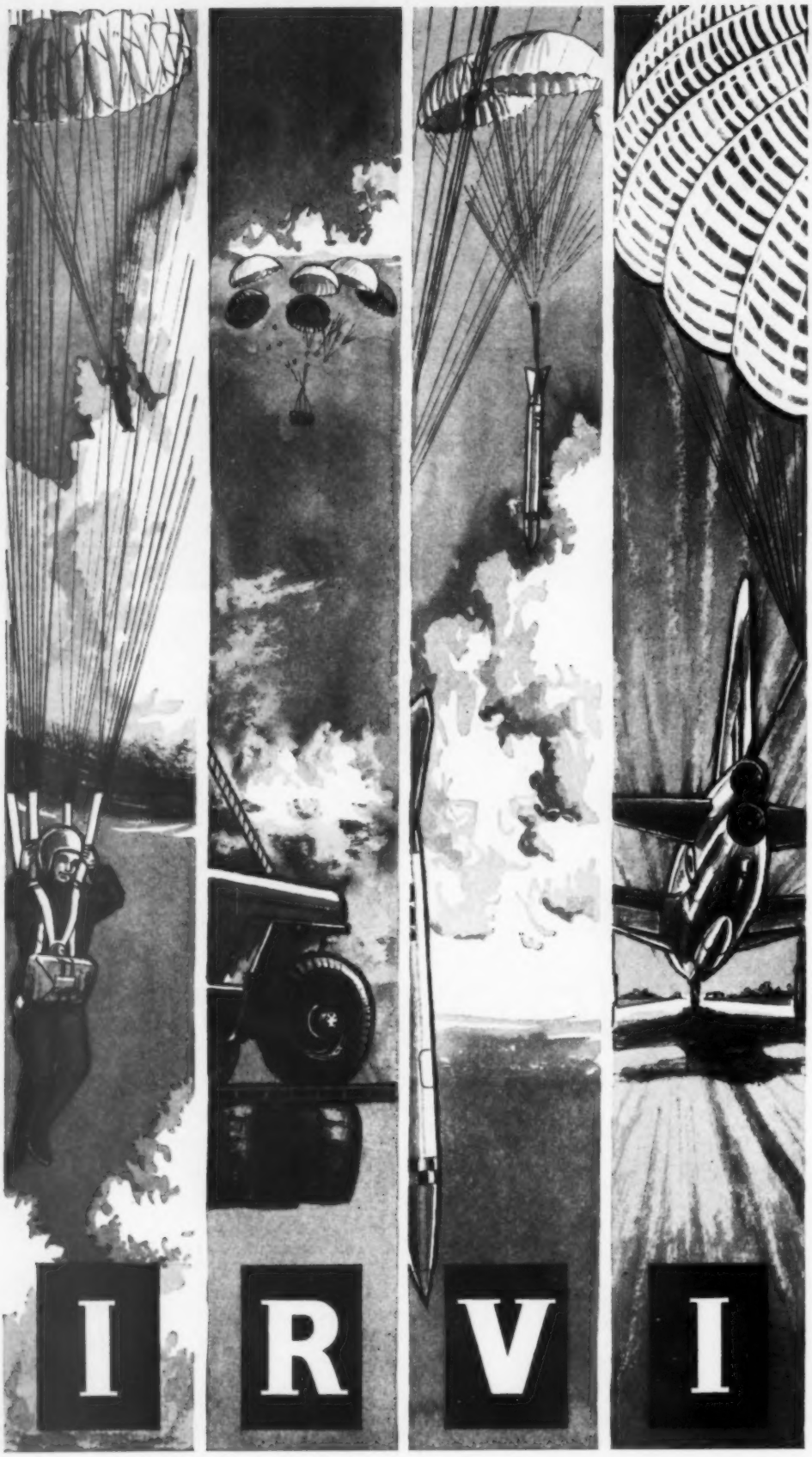

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No 2738 VOLUME 80 THURSDAY 31 AUGUST 1961

FLIGHT
AIRCRAFT, SPACECRAFT, MISSILES

Official Organ of the Royal Aero Club First Aeronautical Weekly in the World Founded in 1909

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Iliffe Transport Publications Ltd, Dorset House, Stamford Street, London, SE1; telephone Waterloo 3333. Telegrams Flightpres London SE1. Annual subscriptions: Home £4 15s. Overseas £5. Canada and USA $15.00. Second Class Mail privileges authorized at New York, NY.

Branch Offices Coventry: 8-10 Corporation Street; telephone Coventry 25210. Birmingham: King Edward House, New Street, 2; telephone Midland 7191. Manchester: 260 Deansgate 3; telephone Blackfriars 4412 or Deansgate 3595. Glasgow: 62 Buchanan Street C1; telephone Central 1265-6.

New York, NY: Thomas Skinner & Co (Publishers) Ltd, 111 Broadway 6; telephone Digby 9-1197.

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A Likely-looking Farnborough

EVERY SBAC Show has its groaners. In general their plaints and predictions are baseless or trivial; but there is one particular wail that has ascended with depressing justification every Farnborough Week for more years than we like to remember. Where, oh where, it echoes, are the little business and touring aeroplanes? The answer this year will be a hearty "Present" from the Beagle Group. Not all present, nor all, perhaps, absolutely correct to production standard. But palpably present or substantially represented nevertheless.

It would still be premature to mark the card of possible Farnborough starters, though we may allow ourselves a little tentative doodling in the margin. Thus, "Hawker P.1127, distinctly possible," "HP.115, ditto," "Bristol 188, most unlikely." But there is plenty more to Farnborough than "actual" aeroplanes, for this is something infinitely greater than a show of flying machines. There are the engines—soaring loftily among the exports; the electronics; the missiles; the accessories and new materials; the profusion of goofle switches; and, of course, the models of things to come, which to many afford more excitement than even the flying display. This year, moreover, there will be the biggest and best Service representation ever.

Viewed from *Flight's* editorial desk, over which the page-proofs of this bumper issue have been flowing in recent days, the 1961 event is a very likely-looking Farnborough indeed. And for some of our overseas visitors perhaps we should explain that "likely-looking" is an English colloquialism meaning "hopeful," "challenging," "encouraging," "promising," and similar agreeable words.

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FROM ALL QUARTERS

Thunderbird Regiment for Germany

A MISSILE unit equipped with English Electric Thunderbird Is —36 Guided Weapons Regt, Royal Artillery—is moving to the British Army of the Rhine in September. It has recently completed training at Tycroes, North Wales, and will be brought up to full strength for the move with 35 officers and 500 men. Organization of SAGW regiments is on the basis of three batteries, each with 12 launchers. A second Thunderbird regiment, No 37, is at Manorbier, Pembrokeshire, headquarters of the Army's School of Artillery.

Heading Beagle Flight Test

Mr R. B. Stratton

ANOTHER new appointment has been announced by Beagle: Mr R. B. Stratton, AFRAeS, has been made the group's chief flight test engineer and took up his new duties at Shoreham on August 14. Formerly with the Royal Air Force, Mr Stratton left the Service in January 1949 to join Saunders-Roe at Cowes as chief flight engineer. In 1954 he set up the flight trials unit for the SR.53, and from 1956 to 1960 was in charge of the project's operation and development at Boscombe Down. He then became chief development engineer, helicopter division, Saunders-Roe, responsible for P.531 and Skeeter development. Mr Stratton has held a PPL since 1948, has a Silver "C" gliding qualification and is an instructor with the British Gliding Association, the RAF Gliding and Soaring Association, and the Air Training Corps. As an RAFVR squadron leader he is on the staff of the Hampshire Wing of the ATC.

Beagle's Autogyro

BEAGLE have now entered the rotating-wing field, with the Beagle Miles-Wallis WA116. This machine was developed by Wg Cdr K. H. Wallis on the basis of the American Bensen Gyro-Copter design, which was intended for the amateur constructor flying for his own amusement. As developed, however, it is intended as a reliable single-seat autogyro for serious operational purposes. Powerplant is a 70 h.p. McCulloch two-stroke.

The Wallis autogyro as it now exists is described as "a beautifully built little machine that speaks volumes for the engineering design ability and the workshop craftsmanship of Wg Cdr Wallis. His method has been consistently to find simple design solutions, but in every case the simplicity is that of refinement, not of crudity; and in this essential his aircraft is fundamentally far removed from the original American line of thought."

Definitive performance figures are not yet available, because calibrations have yet to be done; but Wg Cdr Wallis has demonstrated that in zero-wind conditions the autogyro will take off in about 25yd and climb at something over 1,000ft/min. The machine cruises "effortlessly" at 67-70kt, can be flown without losing height at as low a speed as 10kt. Maximum take-off power is 65 b.h.p., gross take-off weight 580lb. A photograph appears on page 289.

ARRESTING SPECTACLE at the Farnborough Display next week will be a demonstration of the new RAE/Dunlop anti-overrun gear, here illustrated in use: the Scimitar's arrester hook has just engaged the cable, and nylon webbing bands are being drawn from the drums of energy-absorbing units sunk flush on each side of the runway and utilizing multi-disc brakes. The new gear is referred to on page 322 of this issue

A. V. Roe Canada President

NEW president and chief executive officer of A. V. Roe Canada Ltd is Mr T. J. Emmert. His appointment, taking effect from August 23, was announced last week by the company chairman, Sir Roy Dobson.

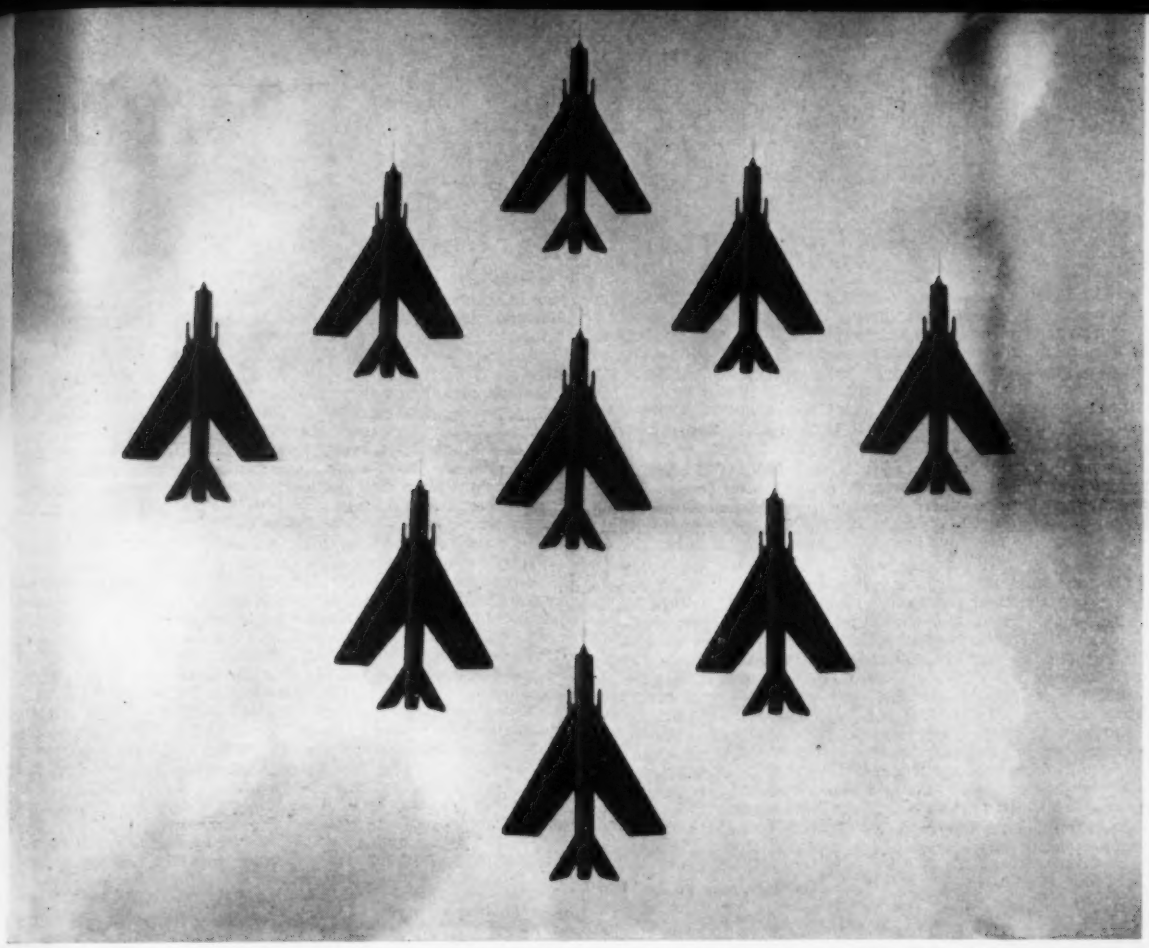
Mr Emmert, in the words of the official announcement, "has had an outstanding career and considerable experience in aviation and in general manufacturing." After holding an executive position with Boeing, he joined Canadair, becoming a vice-president and director. In 1950, at the age of 34, he was made executive vice-president of Ford of Canada. He became a vice-president of Massey Ferguson in 1959 and has relinquished this position to take his new appointment, previously held by Sir Roy Dobson.

British Airborne Digital Computer

IN conjunction with MoA and RAE Farnborough, the Applied Electronics Laboratories of the General Electric Co Ltd at Stanmore have been developing an airborne digital computer system with the name Dexan (Digital Experimental Airborne Navigator). Details of the device, and of the progress of experiments in an RAE Comet from Boscombe Down, have been released since the "new equipment" information in subsequent pages of this issue went to press.

Fully transistorized, the computer incorporates both digital differential analyser and incremental whole-number sections. A ferrite core store will retain 1,024 20-bit words. Analogue-to-digital converters and appropriate output units have been added. For the navigational experiments, which have utilized only a portion of the

BREEDERS OF BEAGLES: The team behind—or more accurately in front of—the Beagle B.206, which was rolled out at Shoreham on August 15. In the centre will be recognized Mr Peter Masefield, managing director of British Executive and General Aviation, flanked by Messrs G. H. Miles and J. W. P. Angell (left) and F. G. Miles and Tom Rickard (right). The aircraft (which is powered by two 260 h.p. Rolls-Royce Continental IO470Ds) was described in detail in "Flight" last week



FEARFUL SYMMETRY was William Blake's description of the tiger in his poem of that name. Here are the RAF's "Flying Tigers"—No 74 Sqn—practising their Farnborough contribution with their English Electric Lightnings. A ruler placed along the tips of the Airpass radar bullets discloses that one or two are at least nine inches out of alignment, but there is hope for something tidier on the day

computer's capacity, Marconi Doppler, Sperry Rotorace gyro and a RAE Topographical Display Unit based on "half-million" map strips have been used, with Decca Navigator to provide the basic reference fixes. Hyperbolic conversion in the air could be incorporated on a time-sharing basis.

A complex version of Dexan would occupy one cubic foot, weigh 50lb and be available in five years. A simpler unit to perform hyperbolic conversion and little else would be available in two or three years and might cost about £5,000. More immediate application would appear to be for stand-off missile launch calculations in V-bombers or for the management of supersonic strike aircraft.

WAITING IN THE WINGS for "The Longest Day": ex-Belgian Air Force Spitfires, which are among aircraft taking part in the D-Day film of this title, seen at Ostend Airport. In the foreground is apparently a Packard Merlin-engined LF.16E; behind it a Mk 9. Finding aircraft and pilots has been the responsibility of the air consultant, Capt John Crewdson of Film Aviation Services Ltd

IN BRIEF

A contract for the first United Nations aerial survey in Africa was awarded recently to Hunting Surveys, part of the Hunting group. It covers nearly 12,000 sq miles in two areas of Uganda.

Col Chesley G. Paterson, appointed Chief of Staff of the US Fifth Air Force at Fuchu, Japan, is a former CO of No 71 Sqn, first of the three "Eagle" squadrons. He holds the British DSO and DFC.

Lord Waterpark has joined the sales division of Vigors Aviation Ltd, sole UK distributors for Piper Aircraft. He was until recently a director of Spartan Air Services in Kenya and also CFI of Subukia Flying Club. He holds a current Commercial Licence and Instrument Rating, and has flown more than 30 types of American light and executive aircraft.

Following the retirement on August 31 of Mr Warren Lee Pierson, chairman of TWA's board of directors and chairman of the executive committee, Mr E. O. Cocke, now system general manager and senior vice-president, will take up the newly created position of senior vice-president industry affairs and senior counsellor to the president. Floyd D. Hall, at present vice-president and general transportation manager, will take over Mr Cocke's position, while J. E. Frankum, general transportation manager for the Atlantic region, will succeed Mr Hall. Mr Warren Lee Pierson will continue to serve on the board.

The 515 items of information presented in the *Spacecraft Scoreboard 1961* tables in *Flight* of August 17, included three errors. The orbital period of Vostok 2 should have read 88.6min; the date of launch of Discover 18 was December 7, 1960; and the "remarks" entry for the Soviet Venus probe should have read "radio contact lost on February 17; attempt during June to re-establish contact from Jodrell Bank inconclusive." Omitted from the main table were the radio frequencies of Transit 4A, which are 54 and 324Mc/s. The number of Capt Grissom's Mercury capsule was 11, and not as stated in the article "The Year of the Astronauts."

Next Wednesday's (September 6) issue of our associated journal *Amateur Photographer* is a special Enlargers and Projectors Guide.

TWO MORE "FLIGHT" SHOW NUMBERS . . .

Sept 7, FARNBOROUGH REPORT **Sept 14, FARNBOROUGH REVIEW**

AIR COMMERCE

BEA and the Future

ACCORDING to Lord Douglas, BEA "may have difficulty in remaining in the black during the current financial year." The corporation's chairman said this at the news conference on August 22 at which BEA presented its 1960-61 annual report (reviewed last week). The right hand graph below, described on the same occasion by the corporation's chief executive, Mr Milward, as "highly alarming," shows the decline in profit—less than £½m for the 12 months to the present date, compared with more than £2m a year ago.

The now very real prospect of BEA having to record a loss in the current year comes as something of a shock after seven years of profitability. Despite valiant efforts to save on expenditure during the current year (£450,000 was saved between April and July 1961) there has, in the first four months, been a shortfall in revenue of £1.7m.

The root cause of the trouble is excess capacity. This is a trouble which BEA shares at the present time with all the world's major airlines, and it is no less serious for having been predicted—by ICAO as well as by many others—during the past three or four years. BEA cannot say (and Mr Milward, the chief executive, specifically does not say) that there has been a slump in traffic. In fact the corporation is doing quite well, if not as well as last year: during the first four months of the current financial year (1961-62) traffic, according to a rough *Flight* estimate, has been 11½ per cent up on the corresponding four months of the previous year. But capacity has been 21.4 per cent up. The result is that BEA's load factor has fallen from 67 per cent in the first four months of last year to 61.5 per cent in the first four months of the current year. This is a drop of 5½ percentage points—each one of which costs BEA £¼m at its present scale of business—and it is a load factor well below the 65 per cent with which, Mr Milward says, "BEA cannot live."

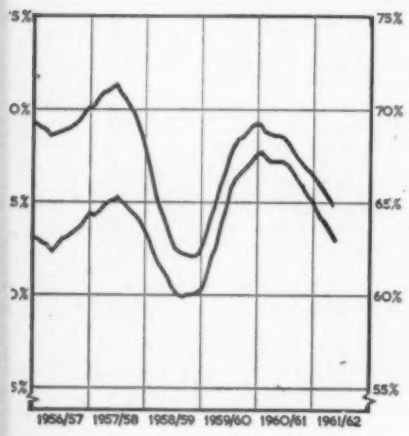
Mr Milward says that BEA's success in remaining in the black during 1961-62 depends now on winter results—"If we can hold our losses, if we have good weather and if domestic traffic comes up, we may just scrape through." Despite this optimism, it is nevertheless likely that BEA's shareholders will have to brace themselves for a loss of perhaps £1m or more in 1961-62. It may fairly be said that excess capacity, assuming that there is a reasonable traffic growth, is a trouble for which the airlines can blame nobody else but themselves, and the quality-competitive world in which they live. But BEA in particular has worries about things over which it has no control. One of these is the outcome of the Air Transport Licensing Board's recent hearings into the independents' bid for a major network of European and domestic routes. In his report, Lord Douglas says he cannot "currently feel sure that the [Tridents] BEA already has on order will actually be required in the years ahead." Pressed to clarify this point at his news conference, the chairman appeared to recant on this statement, though he did not recant on another passage in the same context to the effect that BEA "are far from knowing" that they have a requirement for 12 additional Trident 2s in 1966.

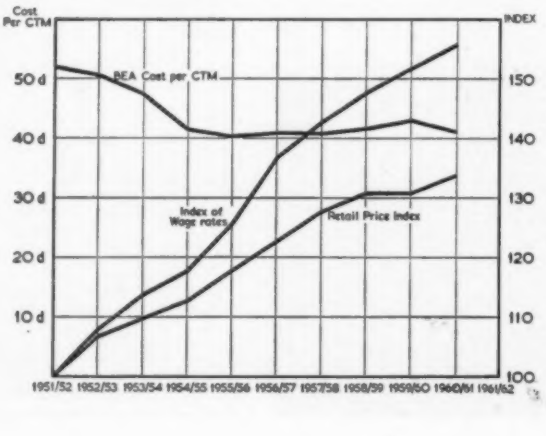
Mr Milward said that he had found it difficult during the ATLB hearings "to keep a straight face" when independents talked about lack of competition in Europe. He than ran though, as effectively and convincingly as he had done before the ATLB some weeks before, the BEA success story. Excerpts: whilst world total passenger growth in the 1950-60 decade was less than 300 per cent, BEA's was nearly 450 per cent. Whilst world air freight grew in the same period less than 200 per cent, BEA's grew by nearly 350 per cent. Lest anyone should think that BEA's domestic fares are higher than those elsewhere, Mr Milward showed how, despite a much lower average journey length, the fares per passenger mile on BEA's main trunk routes are less than 4½d—less than the Australian level and less than the US domestic trunk level (more than 5d). And whilst all other costs had gone up (see middle picture below) BEA's costs had come down.

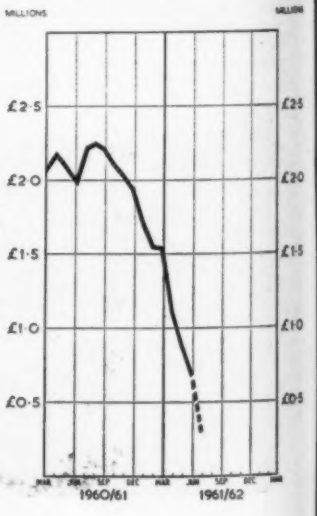
The question of pooling came up at the news conference. Lord Douglas was asked whether he had any comments to make on the adverse comments which had been made on BEA's pool agreements. Lord Douglas: "Yes, they are nonsense." (At this point there was laughter, in which Lord Douglas joined, when he made it clear that it was the comments on pooling, and not pooling itself, that were "nonsense.") On British United's renunciation of pooling, Mr Milward recalled that when BUA and Skyways "wanted to come in" on Gibraltar [BUA] and Malta and Tunis [Skyways], "they asked for a pool which operates to this day." Why then BUA's sudden recantation on pooling before the ATLB? The independents knew that without a pool with BEA they would have been seen off on these routes. Did this mean, Lord Douglas was asked, that BEA was subsidizing these independents? Lord Douglas: "No, certainly not." Would BEA go into pool with the independents if they are licensed? "No," said Lord Douglas, "they say they want competition and we will jolly well give them competition."

Other points made in answer to questions at the news conference: (1) Negotiations about the purchase of American helicopters are at "rather a delicate point," and Lord Douglas would rather not speak on this. (2) The criticisms by MEA's chairman, Sheikh Najib Alamuddin, of "poaching" in the Middle East by BEA and its associates was "another piece of nonsense." BEA was flying these services for Cyprus Airways—"If the Sheikh gets rid of BEA he will find himself with a rather more tiresome operator on his hands"—KLM and BUA had both tried to get in there. (3) BEA's Heralds will be delivered in the autumn and put into service in the spring; the Argosy will enter service on November 1. (4) The proportion of BEA's freight business sub-contracted to independents is about 10 per cent. The corporation's charter contracts with Skyways and others will cease in October. (5) Vanguard delays have cost BEA between £1m and £2m—"We are changing engines every 400hr; without the nine months' delay we would have been up to 1,200hr by now." (6) The 5 per cent increase in European fares will earn BEA perhaps an additional £400,000 in the current year, and perhaps £2m over the whole of next year. (7) BEA never thought they would make a profit on the Manchester route; they now do so "despite the fact that we pay £40 at each end in landing fees, taking the total revenue of eight passengers just to pay landing fees on a 180-mile flight." (8) BEA agrees with most of the things said in the Select Committee report on airports but does not think that the proposed additional costs should be borne by the airlines. Other governments take "a more enlightened view" and do not charge; and BEA cannot accept the proposal for a standard passenger service charge on both domestic as well as international flights.

Left, BEA total and passenger load factors on a moving annual basis, 63 per cent being at present about break-even. Centre, BEA's cost level compared with the trend in UK prices and wage rates. Right, the "highly alarming" BEA profit on a moving annual basis







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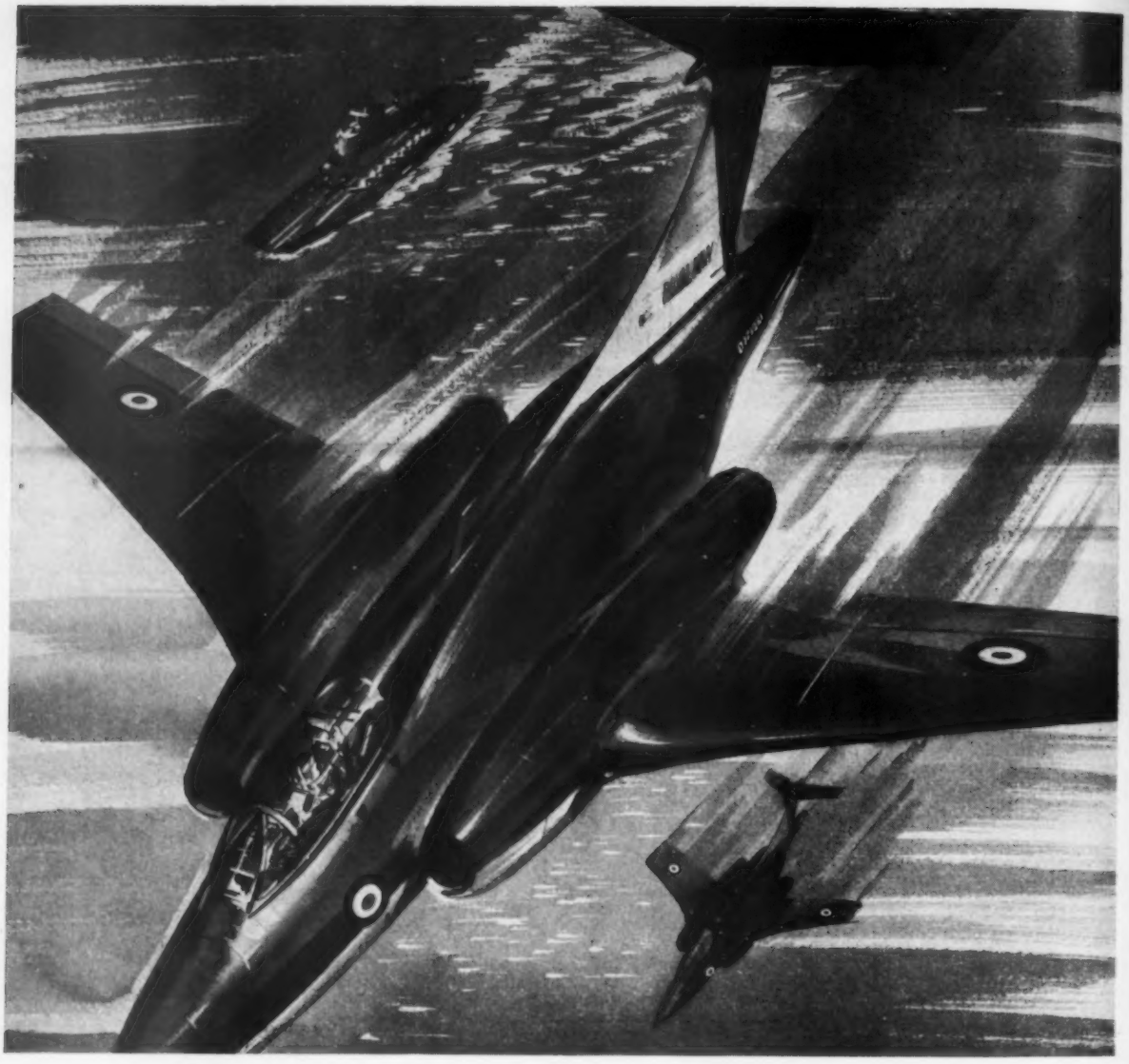

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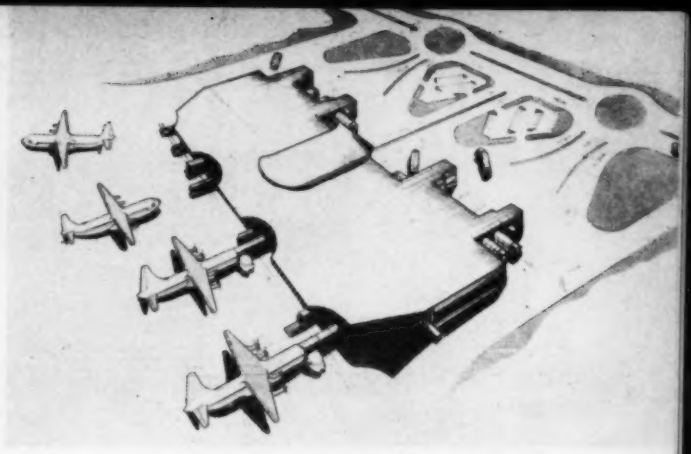

This is a new version of Short's freight handling system, first exhibited at Paris in May, developed to exploit the freighting capabilities of the swing-nose civil version of the Belfast. Departing freight is unloaded on to a conveyor system and transferred via powered rollers to the loading piers. While moving along the conveyors the freight is automatically weighed and is then sorted, stacked and secured either in pallets or freight cages. Each pier has two decks to facilitate loading the double-floored Belfast. A model of the terminal will be displayed at the SBAC show

AIR COMMERCE . . .

MR MYHILL'S ASSETS

ACCORDING to a statement made by Mr Ronald Myhill, chairman of Overseas Aviation Ltd, to the *Financial Times*, it is not possible for any of the creditors of Overseas Aviation (CI) to have any interest in the aircraft owned or being purchased by Overseas Aviation Ltd. Mr Myhill has also said, according to the *Sunday Express*, that if Overseas Aviation (CI) is wound up its creditors will be lucky if its assets realize £80,000. He is reported by the same newspaper to have said: "Actually the company [Overseas Aviation (CI)] does not own a single plane. The planes it uses come under another company, Overseas Aviation Ltd, which my wife and myself own." The *Sunday Express* comments: "This suggests that whatever may befall the creditors of Overseas Aviation (CI) Mr Myhill will be all right. Quite legally of course."

The Economist comments that Overseas Aviation (CI) "does not own the aircraft it flies and could not, therefore, offer its fleet as security for its debts." Adding that the aircraft belong to a "quite separate company," Overseas Aviation, the paper remarks that the facts about the ownership of the aircraft "were presumably known to suppliers when they advanced credit."

The facts are that, until two or three months ago, the majority of the aircraft operated by Overseas Aviation (CI) were indeed registered under the name of that company. The following *Flight* table shows the dates on which ownership of the fleet of seven Vikings and five Argonauts was transferred from Overseas Aviation (CI) to Overseas Aviation Ltd, as recorded in the *British Register*:—

Aircraft Registration		Date of British Register in which ownership is transferred from Overseas Aviation (CI) Ltd to Overseas Aviation Ltd
Viking	G-AGRP	August 1961
	G-AGRW	July 1961
	G-AHOU	February 1961
	G-AHPB	August 1961
	G-AHPE*	
	G-AHPJ	August 1961
	G-AIVK	June 1961
Argonaut	G-ALHG	June 1961
	G-ALHN	August 1961
	G-ALHP	July 1961
	G-ALHS	July 1961
	G-ALHY	July 1961

* Always owned by Overseas Aviation Ltd

Three Herons bought by Overseas Aviation Ltd from WAAC Nigeria (G-ARKU, G-ARKV and G-ARKW) appeared in the June 1961 edition of the *British Register* as having been sold to the Admiralty. The company's two Ambassadors (G-ALZN and G-ALZV) have been registered as owned by Overseas Aviation Ltd since their acquisition from BEA.

The value of all these aircraft and spares and equipment at today's market prices might be of the order of £200,000 to £300,000, but they are not the assets of the company which is in debt. Ownership of the eight TCA North Stars so far delivered is not to be found from the *British Register*, since these aircraft have been operated under a temporary validation of the Air Registration Board's C of A. A point of interest to creditors is that, according to the statement published on June 14, 1961, by Overseas Aviation (CI) when the deal with TCA was announced, these aircraft and "a vast quantity of spares" were purchased by Overseas Aviation (CI) Ltd.

SPAIN NEXT YEAR

SIX weeks of hearings, at a steady grind of four days a week, morning and afternoon, is the programme set by the Air Transport Licensing Board to clear away the many hundreds of applications that have been put forward for inclusive tours next summer.

This crash programme compares with the leisurely course followed by the ATAC. In those good old days, the IT hearings took up most of the autumn and many decisions were not made known until shortly before Christmas. Now there is the prospect of many tour operators being informed of decisions on at least some of their applications before September is out—well in time to allow brochures to be compiled and distributed in time for the crucial first few weeks of December.

Undoubtedly, the main feature of the current round of applications is the heavy demand for licences to Spain, the main points being Palma and the Costa Brava. Rapidly on the up-and-up—that is if the Board gives it blessing—are Malaga and Valencia. This trend is likely to be a consequence of this year's experience in the mass travel market—many agents have burnt their fingers playing with resorts off the beaten track and have found themselves unable to satisfy the unexpectedly voracious demands of the British tourist for Spanish holidays. As a result, all the operators—scheduled and chartered—have been turning customers away.

At first there was some doubt as to whether the ATLB would evolve a sufficiently flexible procedure to deal with the vast number of operators, agents and objectors who participate in these major IT hearings. In practice, the system of dividing the Board up into two panels—one for morning hearings, the other for afternoons—is working smoothly, and the procedure appears to have inherited some of the informality and friendliness which characterized the ATAC hearings under the late Lord Terrington.

BRITISH RAILWAYS APPEAL

BRITISH Railways are putting up a strong fight against depredations from the air. BR's objections to applications for new air service licences have been cogently argued before the Air Transport Licensing Board, notwithstanding the fact that it is the duty of that Board to "further the development of British civil aviation." Now BR has appealed against the decision of the Air Transport Licensing Board to grant a licence to Morton Air Services Ltd for a service between Swansea and Birmingham. The licence approved by the Board provides for a daily service, operated by Doves or Herons, at a single fare of £3 15s and £7 10s return. The comparative first-class rail fares are £2 8s 6d single and £4 17s return. The appeal will be heard on Thursday, September 14, at No 10 Carlton House Terrace, London S.W.1.

BEA SELLS ITS DC-3 PIONAIRS

IT is worth putting on record how BEA has disposed of its fleet of 33 DC-3 Pionairs since November 1959. Apart from G-AGZB, which was written off after an overshoot at Elmdon on October 31 last, and four leased to Cambrian, all the Pionairs have now been sold. Four have been sold to Cambrian (in addition to the four on hire), one to F. J. and D. Mann & Co Ltd, two to Jersey Airlines, two to Field Aircraft Services, three to the Ministry of Aviation as a gift to the Republic of Mali, two to Derby Aviation, five to East Anglian Flying Services, three to Autair Ltd, two to the International Development Finance Corp, and one each to Air Links Ltd, Air Ceylon, Martins Air Charter, North-South Airlines, BKS, Travelair (Southern Rhodesia), Astraeus Ltd and the Dutch firm of Scheetvaart en Steekolen.

CALEDONIAN MAKES ITS BOW

SCOTLAND'S new independent, Caledonian Airways (Prestwick) Ltd, is due to start operations in December with two DC-7Cs acquired from "a European airline." Negotiations for the acquisition of these aircraft are virtually complete, and Caledonian intends to specialize in IT and group charter services. A number of applications have been submitted to the Air Transport Licensing Board. The latest application, in conjunction with Inter-Tours Ltd, is for a fortnightly flight between Gatwick and Moscow.

Mr Alan Bartlett, North Atlantic manager of Caledonian, says that enquiries so far received, primarily from Scotland, justify the company's interpretation of potential charter and IT traffic. Caledonian intends to employ about eight crews for its DC-7Cs and recruiting is almost completed. During the four months since the airline was formed offices have been opened at Horley, near Gatwick, and at Prestwick.

A TWA Boeing 707-331 is seen here being refuelled at Shannon. The building to the left of the control tower was completed last year, and comprises a customs hall, transit lounge, duty-free shop, restaurants and a public gallery

AIR COMMERCE . . .

MINIMUM-NOISE ROUTINGS AT HEATHROW

ALTHOUGH noise monitoring has for some time been in force at London Heathrow it is only recently that a system of minimum-noise routings has been developed. This system was introduced on an experimental basis from 00.01 hr on August 21, and was evolved from a noise abatement exercise carried out in May and June during which all aircraft departing from Heathrow in certain directions followed specified routings. From this it was established that significant reductions in noise could be achieved in large communities west of the airport by following such routings. Details of the new routings are given in Notam 594/1961, and the procedures will apply to all aircraft, not just to jets. The new routings apply to take-offs from Heathrow's main runways (28R, 28L and 10R) from which most departures take place, and the communities affected are Heston, Hounslow, Isleworth, Twickenham, Hanworth, East Bedfont, Feltham, Sunbury and Ashford to the east and south, and Colnbrook, Horton, Datchet, Wraysbury, Windsor and Slough to the west of Heathrow.

When a westerly traffic flow is in operation, there will be preferential use of runway 28L for landing for noise reasons, and a similar use of 28R for take-off. Operators are recommended to advise ATC in advance when operational conditions necessitate taking off from 28L. For some routings, notably those to be followed after take-off from runway 10R, additional guidance may be desirable and this feature is being investigated. The minimum noise routings are supplementary to the noise abatement take-off techniques currently used, and operators will be informed by the Ministry's Operations Branch, Southern Division, of the manner in which noise monitoring will be applied to aircraft using the new routings.

GETTING THE PASSENGERS BACK

ON August 19 the pilots of Overseas Aviation (CI) Ltd refused to fly their aircraft on the terms offered by Derby Aviation. Derby was to have operated about six Argonauts during the remainder of the season to enable Overseas' undertakings to travel agents to be met. The Overseas pilots were prepared to make the necessary flights on the weekends of August 19-20 and 26-27 without payment to bring back passengers abroad; alternatively they were prepared to operate on a commercial basis, which would have meant Derby paying all the monthly salaries of Overseas' staff up to August 21. Derby were prepared to pay on a *pro rata* basis only the eight operating crews who would have been involved that weekend, instead of all the operating staff; the Overseas pilots were insisting on equal treatment for the whole staff. They had earlier refused to fly as a result of Mr Myhill's statement, as reported by Derby Aviation, that he could not pay their salaries. Derby subsequently made arrangements with several agencies, including Ellis Air Tours Abroad of Manchester, Midland Air Tour Operators and Anglo-Jugoslavia Travel.

Other IT operators affected by the collapse of Overseas were Arrowsmith Holidays (rebookings made with Starways); the National Union of Students (flights arranged by Wayfarers Travel Agency, Air Safaris helping out); Panorama Holidays; Pegasus Holidays (Piccadilly) Ltd (flights taken over by Pegasus Vikings and Trans-Atlantic Airways DC-4); Poly Travel; Sunflight Holidays (Ellis Air Tours Abroad); Swan Tours Ltd; Swiss Travel Service (DC-4 chartered from Balair in place of Derby-operated Overseas DC-4M); Tartan Arrow Continental (only pilgrim flights affected; rebookings made with Pegasus); Transglobe and Wings. Many agencies are sustaining a loss—in some cases considerable—through having to rebook their tours on airlines which cannot match the uneconomically low rates of Overseas; the original advertised tour prices are in almost all cases being maintained. None of the estimated 18,000 holiday-makers who were to have flown into or out of Britain by Overseas during the remainder of the season are likely to miss their holiday. Mr M. Blakemore, secretary of BIATA, has said: "No one is going to be stranded whether they are on holiday abroad at the moment or whether they are about to fly out of this country on holiday. It is too early to give precise details of the alternative flights but no one will suffer, we are happy to say." Not long after a protest stoppage on August 22 of Gatwick maintenance engineers employed by Overseas Aviation Engineering (GB) Ltd, British United Airways announced that discussions had opened with Overseas regarding the acquisition by BUA of the Overseas timber hangar at Gatwick.

Footnote: Acting on behalf of Overseas Aviation (CI) Ltd, Phillip Mills and Co, solicitors, have issued a writ against BP Trading Ltd claiming damages for alleged breach of contract to supply aviation fuel.

AER LINGUS HITS THE JACKPOT

AER LINGUS has always taken conscious pride in the way in which its affairs are described in the annual reports to its shareholders—the public of the Republic. Although the latest annual report continues to provide a comprehensive description of Aer Lingus in the year 1960–61, the affairs of its younger brother Aerlinte Eireann are only covered in a very sketchy way. It is to be hoped that subsequent reports will acknowledge that Aerlinte—from a statistical and financial viewpoint—now deserves to be treated as an adult airline.

To put the activities of the two Irish airlines into perspective, it is appropriate to start by building up a consolidated operating account for the entire Aer Rianta enterprise. This shows total revenue in the year 1960–61 of just over £7¼m—Aer Lingus, £4.9m; Aerlinte, £2.4m; Dublin Airport, £.3m. Equivalent expenditure amounted to just over £7¼m—Aer Lingus, £4.7m; Aerlinte, £2.9m (of which £½m development expenditure was capitalized); Dublin Airport, £.2m. By comparison, the total capital tied up in the enterprise added up to £12m, comprising £10m of Aer Rianta shares (of which £6.9m has been put into Aerlinte) and £3.1m into Aer Lingus, and loans of £1.8m—(£1.5m on account of Aer Lingus, and £.3m on account of the parent company in respect of the construction of a new jet hangar at Dublin Airport. The small remaining balance consisted of the slender reserves that Aer Lingus has managed to accumulate over the years.

This roughly compiled consolidated account shows that although Aerlinte was only producing one-third of the enterprise's total revenues, it has absorbed well over half the total capital. The three Boeing 720s have so far cost £3.8m—a figure exactly equal to the written down value of the entire Aer Lingus fleet of seven Viscounts, seven F.27s and five DC-3s—while the accumulated deficits incurred in the first three years of North Atlantic operation have amounted to £1.7m. This has been capitalized in the form of a development expenditure account. In addition, Aerlinte's accounts show an excess of as much as £1m of current assets over current liabilities.

The 1961–62 accounts should show a radically different relationship between Aerlinte and Aer Lingus, for the Boeing 720 fleet will then have had a full year's operation. This could even result in Aerlinte's revenue approaching that of Aer Lingus. As it was, in 1960–61 the North Atlantic route had already become the most important single route for Irish International, showing a passenger revenue of £2.1m. By comparison the Aer Lingus London services showed £1.8m passenger revenue, the equivalent figures for Ireland/UK provinces and Ireland/Continent services being £1.2m and £.9m respectively.

Aerlinte enjoyed a 51 per cent increase in traffic in 1960–61 compared with the previous year, the number of passengers rising to 35,000. Load factor rose from 44 per cent to 62 per cent, a remarkably successful figure for the third year of

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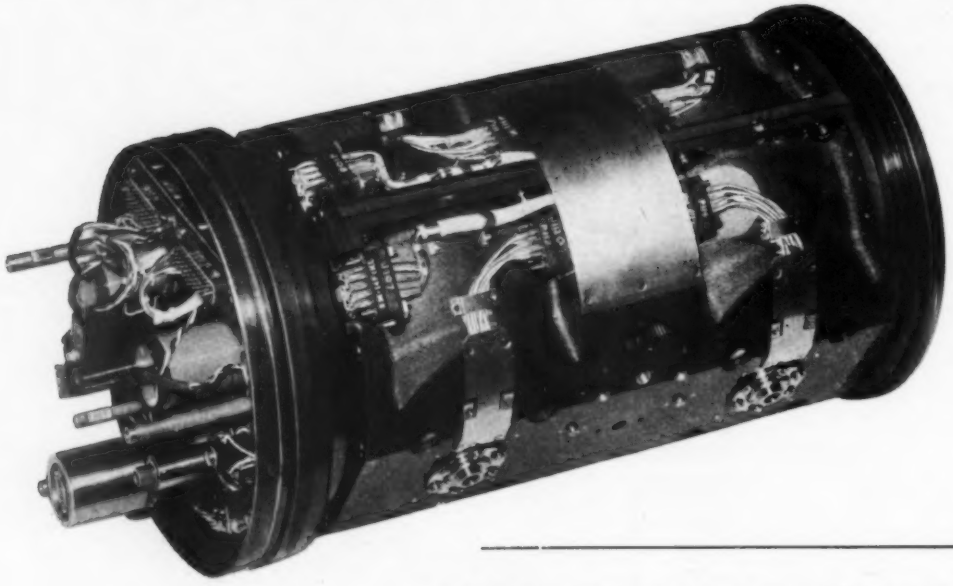

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AIR COMMERCE . . .

operation on this most competitive of routes, and not far short of the break-even level.

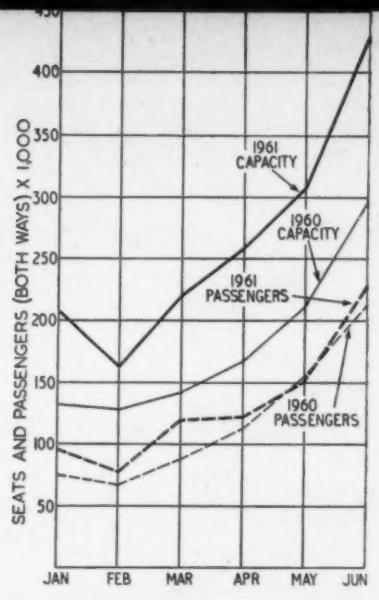
Unfortunately the paucity of statistical information on Aerlinte's activities prevents any analysis of this company's results. The operations of Aer Lingus, however, are fully documented and it is possible to appreciate the factors that made 1960–61 a highly successful year for this ultra-short-haul carrier. Last year was one of those periods when all the economic indices moved in the right direction: unit costs fell by 3 per cent to 38d per c.t.m.—a remarkable figure for a system with an average stage distance of only 229 miles, particularly when compared with BEA's cost level of 41.2d; average revenue rates rose by 1 per cent to 59d per l.t.m.; and overall load factor rose from 64 per cent to 67 per cent. As a result Aer Lingus achieved a profit of £¼m before interest payments, the highest figure since its formation 25 years ago. Total traffic increased by 25 per cent to 19m l.t.m., a similar rate of increase being shown for the number of passengers, which rose from 553,000 to 691,000. As in previous years the London - Dublin route bore the heaviest volume of traffic (265,000 v. 214,000 in 1959–60), the next most important routes being Dublin - Manchester (69,000 passengers), Dublin - Birmingham, Dublin - Liverpool and Dublin - Glasgow (each just over 50,000 passengers).

Aerlinte and Aer Lingus together last year experienced a total growth in their business of about one-third. During this year of rapid growth a completely new type of aircraft was introduced into operation, and yet the number of staff during this period rose by only one-fifth, to 3,000 employees. This economy in the use of staff is perhaps the secret of the airline's financial success.

SHORTFALL ON THE ATLANTIC

JUST how serious is the traffic shortfall on the North Atlantic, which the airlines are referring to as a slump? The accompanying graph shows traffic and capacity in the first six months of this year compared with last year. Overall traffic has increased by more than 12 per cent in 1961, while capacity has gone up by 48 per cent. Load factor during the first six months of this year was 50 per cent compared with 65 per cent last year—15 expensive points down.

Whilst a traffic increase of the order of 12 per cent cannot be described as a slump, the situation during the critical first three months of the season—May, June and July—can fairly be described as such. Traffic in these three months increased only marginally—and actually decreased in May, for the first time ever in the history of the North Atlantic route. Figures just published by IATA show that during the second quarter of the year load factor fell by no less than 20.6 percentage points.



This graph, based on IATA figures, shows how capacity on the North Atlantic has been outstripping traffic in 1961 compared with the trend in 1960. See note on this page

Looking at the first six months as a whole, the basic cause of the airlines' economic difficulties is one for which they can only blame themselves—excess capacity. However, the situation would have been nothing like so serious had traffic during the first three months of the season come up to all reasonable expectations, which it did not, largely owing to the fact that the expected number of Americans have not been coming to Europe this year. Fortunately, the signs are that traffic has been picking up during July and August.

Evident from published IATA figures is the continued decline in first-class traffic. More than 85 per cent of the traffic carried during the second quarter—428,000 people—travelled economy-class. No figures are available for the number of passengers carried by IATA and non-IATA airlines on charter flights, though there is no evidence that this type of business, which is diverting much traffic from scheduled flights, has declined.

BREVITIES

Mr L. G. Roberts has been appointed secretary of Cambrian Airways in succession to Mr W. W. Stanley, who has resigned.

Construction has begun on a new international airport at Bole, on the east side of Addis Ababa, suitable for jets, and a jet runway at Asmara. Airport improvements are also scheduled at 24 other Ethiopian cities and towns.

The French Government has approved plans by Sud-Aviation to step up Caravelle production; 200 Caravelles will be built in the next two years instead of the 150 originally planned. A total of 116 Caravelles are currently on order.

Killick Martin Air Ltd, a wholly owned subsidiary of Killick Martin & Co Ltd, has been formed to take over certain aviation functions, including collection and handling of air freight, from the parent company. The new company's registered office is at Dunster House, 20 Mark Lane, London EC3.

In his first statement Mr Curt Nicolin, who on July 15 became president of SAS in succession to Mr Ake Rusck, announced on August 21 the dismissal of about 1,250 ground staff as an economy measure. Mr Nicolin estimated that SAS would have an operating loss of 100m Swedish kroner (about £7m) this year.

The FAA is seeking to impose a $1,000 fine on an airline passenger charged with becoming dangerously intoxicated from his own liquor supply and endangering the flight, passengers and crew. The passenger was Raymond Moore of Los Angeles, and the alleged incident took place on a South Pacific Air Lines flight between Tahiti and Honolulu on March 4, this year.

A DC-8 flew faster than sound on August 21, becoming the first transport to exceed Mach 1, according to Douglas. The aircraft was flying from Long Beach to Edwards Air Force Base at a height of 40,350ft, true airspeed being 660 m.p.h. The DC-8 also exceeded the official altitude record for jet transports by carrying a normal payload to a height of 50,000ft during the same flight.

The ARB announces the issue of the following Notices to licensed aircraft engineers and owners of civil aircraft: No 9, Issue 6, 1 August, 1961; No 46 (Cancellation), 1 August, 1961; No 60, Issue 2, 1 August, 1961.

An extensive administrative reorganization of Japan Air Lines, designed to streamline operations and improve service, is scheduled to be completed by tomorrow, September 1.

The United States has initialled but decided not to sign the United States-Soviet air routes agreement providing for commercial air services between New York and Moscow, due to the present international situation.

Austrian Airlines has signed a pool agreement with Cunard Eagle for London - Innsbruck operations and is operating in pool with LOT on the Vienna - Warsaw route and with TAROM between Vienna and Bucharest.

Cruising speed of the Comet 4C can be increased by 20kt following an increase in recommended cruising r.p.m. of the Rolls-Royce Avon. The improvement represents an increase of 0.03 Mach with an associated rise of 20kt in the permissible indicated airspeed.

In the August *BEA Magazine*, Lord Douglas writes that BEA hopes to be able to start scheduled cross-Channel helicopter services possibly within the next two years, using the Westland heliport at Battersea initially and (presumably) operating Vertol 107s in consortium with Sabena.

History was made on August 21 when the first appeal against an Air Transport Licensing Board decision was heard. On that day Falcon Airways' appeal against a decision in respect of licence B.1253 for inclusive-tour flights to Malaga was heard at Caxton Hall, Westminster; opposing party in the case was BEA. The Commissioner was Sir Leonard Stone. The hearing will be reviewed next week.

Two specials owned and operated by Chris and Claire Roberts at Luton Airport: (top) Leopard Moth G-AIYS, only one year younger than its owners, has been busy this summer flying jockeys, trainers, company directors, engineers, holiday-makers and first-flight joy-riders; (bottom) souped-up, canopied and spatted Tiger Moth G-AHVU incorporates side-opening canopies, upholstered cockpits, new instrument panel and lowered inter-cockpit decking, and has included a 15,000ft crossing of the Italian Alps among its touring trips. Both Leopard and Touring Tiger were rebuilt by Mr and Mrs Roberts

Sport and Business

IN THE OPINION of the Chief Inspector of Accidents, Ministry of Aviation, the fatal accident to Mr D. Dillow in Rollason Turbulent G-APKZ on December 6 last was caused by a structural failure of the starboard wing which in turn was caused by the pilot overstressing the wing structure while performing aerobatic manœuvres. The official report of the accident, published last week by HM Stationery Office at 1s 6d, called attention to a discrepancy in the procedure for the issue of Permits to Fly for light aircraft, and the Ministry of Aviation has announced a clarification of this.

The Turbulent flown by Mr Dillow, who was a member of Biggin Hill Flying Club, was owned by Mr George Stewart, club chairman, and was operated by the club. The cockpit contained a notice stating that the aircraft was non-aerobatic and must not be flown at speeds exceeding 107kt. On the date of the accident the aircraft took off from Biggin Hill at 3.23 p.m. and about 20min later was seen to be performing a succession of aerobatic manœuvres at an estimated height of between 5,000 and 6,000ft. The aerobatics continued for 10-15min and terminated when the starboard wing broke away from the main structure and the aircraft spiralled to the ground. The accident report concluded that (1) the aircraft had been maintained in accordance with the conditions of its Permit to Fly, (2) the starboard wing became detached because of a structural failure of its main spar under g-loading imposed during aerobatic manœuvres, (3) such manœuvres were prohibited under the terms of the Permit to Fly, (4) the main spar was manufactured from materials which conformed to specification, and (5) a discrepancy in the procedure under which Permits to Fly were issued had no bearing on the cause of the accident.

The discrepancy mentioned concerned the delegation of airworthiness responsibility to outside bodies by the Ministry of Aviation. In the case of permits to fly for light aircraft, the Ministry had delegated authority to the Air Registration Board but not, it became evident during the accident investigation, to the Popular Flying Association. The Ministry had in fact been accepting recommendations from the PFA, which therefore were not in accordance with statute. A Ministry announcement published together with the accident report stated that, in future, the Popular Flying Association would make recommendations for the issue of permits to fly for ultra-light aircraft to the Air Registration Board. The Board would then advise the Ministry on the issue of such permits.

An additional observation in the accident report was that, if the reported light stick forces of the Turbulent were truly representative of the type, it was extremely important for pilots to observe the operating limitations of the aircraft.

Seen at the recent Reseau de Sport de l'Air rally at Morlaix: (upper photographs) the Paumier Baladin (90 h.p. Continental); (lower left) the Croses Pouplume (10 h.p. Monet Goyon two-stroke), a variation on Henri Mignet's Pou theme; (lower right) a three-seat Mignet, the HM.390 (90 h.p. Continental)

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SERVICE AVIATION

Air Force, Naval and Army Flying News

Free-falling five: RAF instructors of No 1 Parachute Training School, Abingdon, practising for their Farnborough demonstration. Six of them are participating in the SBAC Show: Flt Lts Peter Hearn and John Thirtle; Flt Sgt Tom Moloney; and Sgts David Francombe, "Jake" McLoughlin and "Snowy" Robertson. Their free fall will be in addition to that performed by Army parachutists of the Special Air Service (see "Services at Farnborough," below)

Pakistan Visitor

COMMANDER-IN-CHIEF of the Pakistan Air Force, Air Marshal Asghar Khan is visiting Britain at the invitation of the Air Ministry. Among his engagements is the Commonwealth Services chiefs conference at the Staff College, Camberley, when problems of common interest will be discussed, under the presidency of Earl Mountbatten. Air Marshal Khan arrived in the UK last Friday, piloting a B-57.

Rhodesian DCAS

A NEW Deputy Chief of Air Staff, Royal Rhodesian Air Force, has been appointed: Gp Capt Harold Hawkins moves into this post with the rank of air commodore. He succeeds Air Commodore A. M. Bentley, who is now Chief of Air Staff.

Services at Farnborough

MORE details have been given of Service participation at next week's SBAC show. The Army Air Corps are appearing first, pilots flying four Skeeter helicopters in low-level formation exercises, or airborne drill. They will be followed by parachutists of the Special Air Service, dropping from 7,000ft—cloud conditions permitting—with a free fall for 5,000ft.

In addition to the main Royal Navy demonstration, which was detailed on this page last week, a PR Scimitar is taking off at the beginning of each day's flying display to photograph the president's tent and other Farnborough features. Before landing half-an-hour later it is to take low-level pictures of HMS *Hermes* in the English Channel, and these photographs will be exhibited before the flying programme is concluded.

The Blue Diamonds aerobatic team of 92 Sqn are putting up 16 Hunters at this year's show; and 74 Sqn—whose participation as one of the three RAF aerobatic teams was referred to on this page a fortnight ago—are expected to do a nine-strong Lightning formation roll.

Brampton Appointment

FROM next October Air Cdre G. H. White, CBE, is to be Air Officer in charge of Administration at Technical Training Command headquarters with the acting rank of air vice-marshal. The air commodore, who is 56, has been Air Officer Commanding, RAF Records, at Gloucester since July last year; he was previously Air Commodore in charge of Organization at Maintenance Command. A cricketer and rugby player, he captained the RAF cricket XI in 1937 and 1938 and has played rugby for Gloucestershire.

Victors in Canada

THREE Victors of 55 Sqn, Bomber Command, are giving displays at the Canadian International Air Show at Toronto tomorrow (September 1) and on Sept 2. They were flying from their base at Honington last Sunday to Malton Airport, Toronto, by way of RCAF Goose Bay. The force is commanded by Wg Cdr R. G. Wilson, CO of 55 Sqn, and supported by a Britannia from Lyneham.

The squadron, which was originally formed in April 1916, was re-formed in 1920 when 142 Sqn at Suez was re-numbered 55. In the Second World War it operated in North Africa with Blenheims, Baltimores and Bostons. It was disbanded in Greece in 1945 and re-formed with Victors in September last year.

RAAF Sabre's cutting edge: a display of armament at Canberra during the recent Chief of the General Staff exercise. In addition to two 30mm Aden guns are 24 rockets, two Sidewinder air-to-air missiles, gelatrol bomb containers, 500lb bombs, small bombs and rocket launchers. Under the wings are 167gal drop tanks. Behind the Sabre is a Canberra, at left a Hercules, in the background three Dakotas of 34 Sqn and another Canberra

IN BRIEF

A £2,400,000 project making RAF Tengah the most modern British air base in SE Asia has recently been completed.

AVM A. P. Ritchie, CBE, AFC, who died recently, was AOC 205 Group in the Middle East and later AOC a Bomber Command group during the last war. He was a Deputy Lieutenant for Suffolk.

Mr Kenneth E. Crickmore, director of the Hallé Concerts Society, and director of the annual RAF Anniversary Concert at the Royal Festival Hall, has been appointed an honorary helper for Derbyshire by the RAF Benevolent Fund.

The next 2 ADU reunion will be on Saturday, October 21, at the RAF Reserves Club, 14 South Street, London W1, at 7 for 7.30 p.m. Remittances (one guinea) to H. Wynn, 35 Hillview Court, Guildford Road, Woking, Surrey.

208 (formerly Naval 8) Sqn Old Comrades Association is holding a reunion at the Swiss Hotel, Old Compton Street, London WC1, on October 28 at 6.30 p.m. Dress informal. Hon secretary is Mr R. W. Booker, 18 Blacksmiths Crescent, Sompting, Sussex.

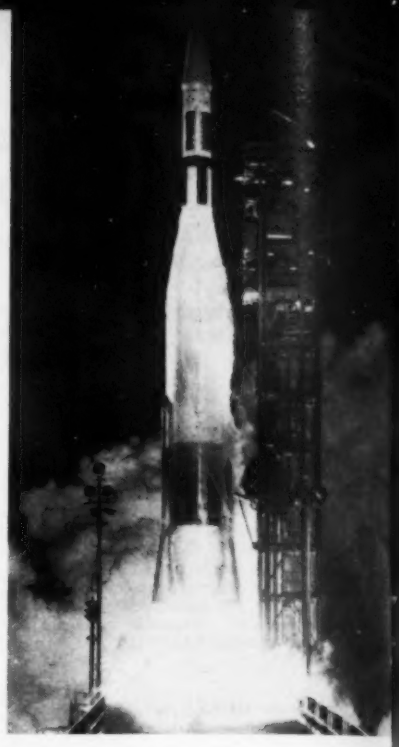
This year's MRES officers' reunion (the thirteenth) will be held in London on Saturday, October 28. Full particulars from Sqn Ldr P. E. Laughton-Bramley, MBE, "Haldon," Nightingale Avenue, West Horsley, Surrey (East Horsley 3255). A stamped addressed envelope should be enclosed.

Missiles and Spaceflight

LOW ORBIT FOR RANGER 1

An unsuccessful attempt to launch the first Ranger spacecraft into a highly eccentric Earth orbit extending to an apogee of 685,000 miles was made from Cape Canaveral on August 23. The first stage of the Atlas-Agena launch apparently functioned as planned, with the Agena B second stage and Ranger spacecraft established in a 100-mile near-circular "parking" orbit. The second stage fired on schedule but the resulting trajectory comprised a low orbit of 105–312 miles altitude.

A full description of the planned Ranger 1 experiment was contained in *Flight* of August 3. The launch had been postponed several times since the end of last month. The main object of the firing was to test the spacecraft system, in preparation for later Ranger craft which will rough-land instrumented payloads on the Moon. The secondary mission of the Ranger 1 launch was to carry out a number of scientific experiments designed to study the nature of cosmic rays, magnetic fields and radiation and dust particles in space.



Lift-off at Cape Canaveral on August 23 of the Atlas-Agena B vehicle carrying Ranger I spacecraft. As reported in the first news item, the first stage functioned as planned but the anticipated orbit was not achieved

UNMANNED MERCURY ORBIT DUE

The most comprehensive test to date in Project Mercury, unmanned orbital flight and re-entry on a completely automatic basis, was due to be attempted from Cape Canaveral as this issue went to press. The flight, fourth in the Atlas-boosted series of Mercury shots, was to comprise one Earth orbit of a Mercury spacecraft carrying special instrumentation and a "crewman simulator." The spacecraft to be used was the eighth of the production capsules, and was the same one flown in the MA-3 one-orbit attempt of April 25 last, in which the launch vehicle was destroyed by the range safety officer after about 40 sec of flight when the booster failed to carry out its correct sequence of operations.

If successful, the MA-4 mission would (1) achieve the first Mercury orbit, (2) prove that the spacecraft could withstand the 2,000°F heat of re-entry eight times longer than in any previous Mercury flight test, (3) demonstrate the ability of the modified Atlas launch vehicle to release the spacecraft at the precise speed, altitude and flight-path angle for orbital flight, (4) prove the integrity of the spacecraft and its interrelated onboard systems on a fully automatic basis for nearly two hours —the projected time "from lift-off to splash," (5) exercise for the first time the worldwide Mercury tracking, data-gathering and communication network, and (6) check the ability of the braking-rocket system to bring the craft down from orbit.

The "crewman simulator" carried was designed to consume oxygen, expel carbon dioxide and fill the cabin with heat and moisture in much the same way as a man would in the course of normal breathing. Two 45min voice tapes were to transmit messages to the Mercury tracking stations to check HF and UHF transmissions. A fully operational attitude control system is carried, with the manual side of the system blanked off, and a complete life-support system is also included.

VOSTOCK 2 CONTROL CENTRE DETAILED

A description of the "co-ordinating and computing centre" in operation during Maj Titov's orbital flight of August 6–7 was contained in an article in *Pravda* on August 17. This centre, it was stated, operated in parallel with the central headquarters and the command post for the flight at the cosmodrome.

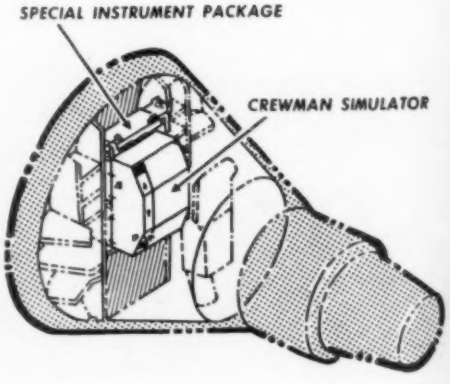
Numerous maps with the route of every revolution of the spacecraft marked on them, the article stated, were placed under glass sheets on the long tables of the Centre. Different versions of these maps provided for "all possible variations of the flight." Nearby, another map showed ground tracking stations and observation ships in the Atlantic and Pacific.

In adjacent rooms at the Centre special equipment was installed to receive instructions from the technical supervisor of the flight at the cosmodrome, and for direct radio contact with the cosmonaut if needed. Electronic computers determined with great accuracy the parameters of the orbit and the landing place. The computing operations at the Centre were paralleled by a number of other major computing stations.

Specialists concerned with all the systems installed on *Vostok 2* were on duty throughout the flight in different rooms in the Centre. They were able to monitor the functioning of the apparatus on board by means of the telemetered data and Major Titov's reports. The Centre was also stated to have "radiation control instruments."

During the descent of the spacecraft its trajectory was accurately checked and recorded at the Centre, and was continuously verified by scores of other direction-finding stations which immediately transmitted their information to the main Centre. Aircraft and helicopters were in readiness to pick up the cosmonaut after landing, and during the final descent these were all in the air "in order to watch the landing visually."

Left, model of the GPO station to be built in Cornwall for transatlantic communication-satellite tests in connection with NASA's Rebound and Relay projects. Diameter of the actual steerable reflector will be 85 ft



Right, sketch showing location of special equipment aboard the MA-4 Mercury spacecraft (see "Unmanned Mercury Orbit Due"). The "crewman simulator" consumes oxygen, expels carbon dioxide, and in general behaves like an astronaut in orbit

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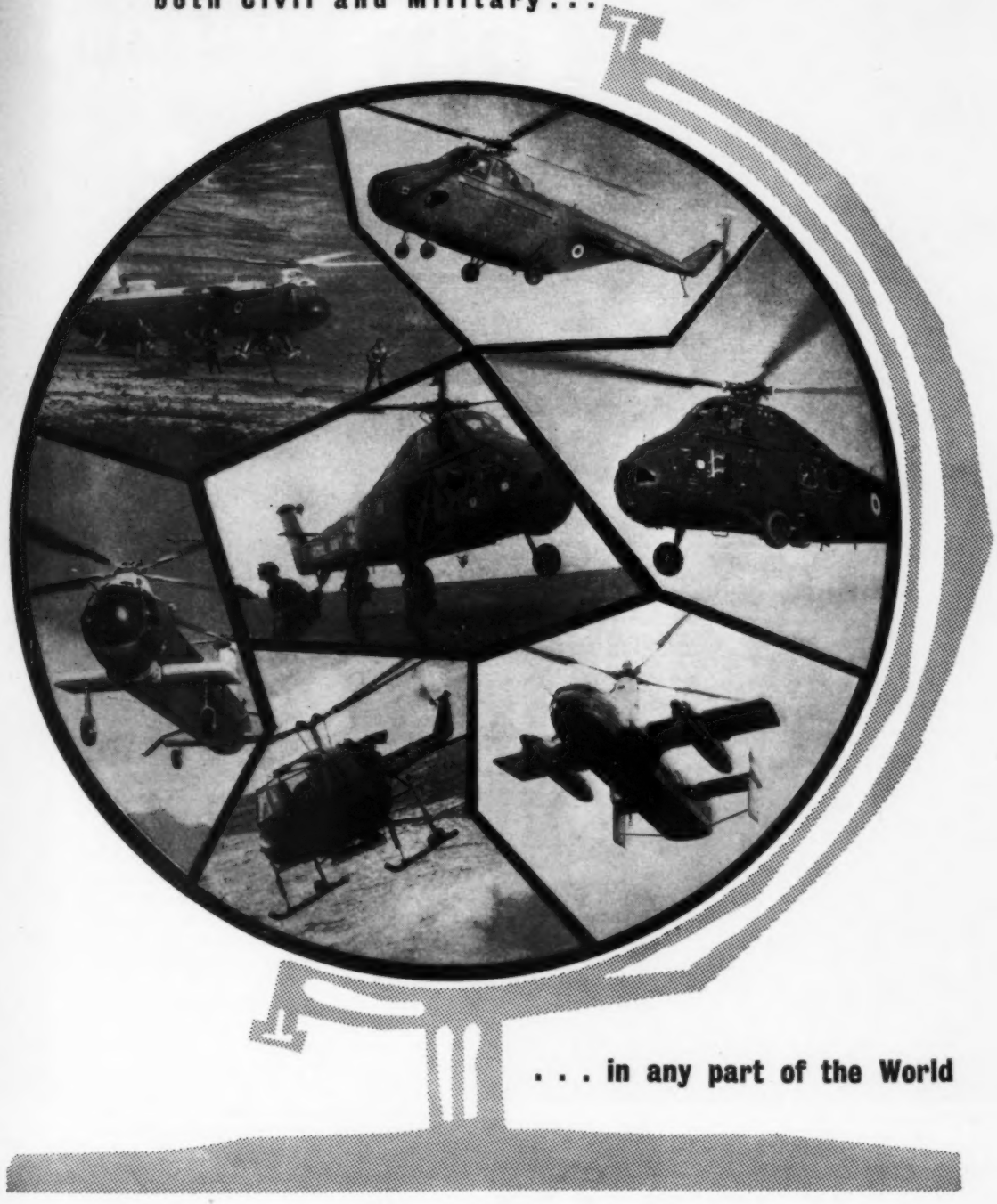

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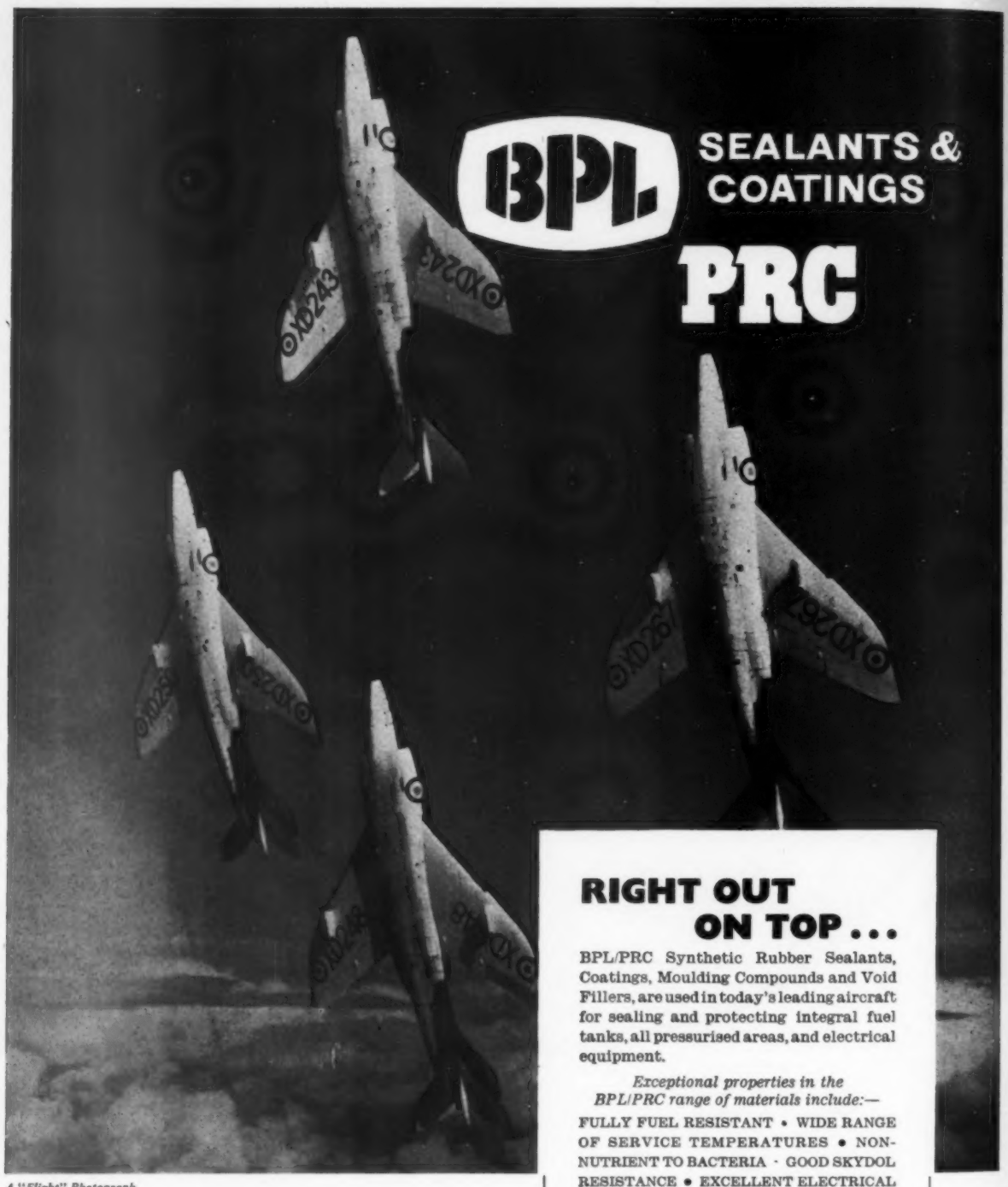

A "Flight" Photograph

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CORRESPONDENCE

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. The names and addresses of the writers, not for publication in detail, must in all cases accompany letters.

Dressing the Window

I RECENTLY had cause to meet the manufacturers and distributors of most business executive aircraft available in this country, and was struck by the most uncommercial surroundings in which these aeroplanes are usually displayed. While one appreciates that the setting of an aeroplane is unlikely to sway the buyer of a £20,000 machine, the prospective buyer's confidence in a firm can often be enhanced by businesslike surroundings.

I would suggest that the larger firms such as Beagle copy Airwork's Cessna display at Panshanger, where the aircraft are displayed in the same manner as a luxury car, in bright, spacious surroundings, with a representative in constant attendance to answer queries. To open a showroom in the centre of London with smart and attractive aeroplanes displayed behind plate-glass windows, for passing businessmen to ponder on, would, I think, be the ultimate.

London W1 GLENMORE TRENEAR-HARVEY

"Local" Flying

I WAS most interested to read Mr Leslie Hunt's article in the August 10 issue, dealing with a subject which is dear to the hearts of many of us in the aircraft industry: the search for licensed premises. In this case, however, Mr Hunt seems to have been rather different from the rest of us, in that he appears to have entered very few of the inns which have such interesting signs.

Although the author notes that he has not yet had occasion to refuel in the West of England, I hope that when he does so he will not miss the "Jet and Whittle" at Lower Tuffley, Gloucester. This inn was opened on November 9, 1953, and is of the pre-fabricated type, as it was not possible at that time to obtain building permission for a more permanent type of structure. The inn-sign shows the Gloster E.28/39 in flight and apparently sky-writing the name in white "exhaust smoke."

I understand that the licence was transferred from a very old Gloucester inn, the "Britannia," before it was demolished and made room for a new block of flats. "Britannia," of course, refers to the lady, not the aeroplane!

The bars of the "Jet and Whittle" are decorated with a number of framed photographs of the E.29/39 and other Gloster aeroplanes.

Gloucester DEREK N. JAMES,
Publicity Manager, Gloster Aircraft Co Ltd

Shopping for Satellite-launchers

QUESTION 1: How many nations can put a four-and-a-half ton man-carrying satellite into orbit?

QUESTION 2: How many would like to?

These flippant questions may have serious answers. There *are* people around who still mutter "size isn't everything," and of course it isn't, but it is a giant stride into space. What can we show?

We can show the best radio telescope in the world—unexpectedly hunting man-made objects; hordes of frustrated spacemen and some dusty parts for Blue Streak; assorted unused micro-miniature instruments; heaps of hopes; and some friends in the Eurospace Club.

If and when Blue Streak arrives in five or six years' time, no one seriously pretends it will have much to teach the Americans or the Russians. *So why don't we try to hire a satellite-launcher?*

Diplomatically it might be very difficult for the United Kingdom Government to approach either the USA or the USSR for the loan of a booster. But there is nothing to stop British businessmen from enquiring the cost of a wet-lease (with crew) and a dry-lease (bare hardware). Our scientists and engineers—in company with our European friends—would learn a great deal from operating a few Russian or American rockets. This *could* be the cue for the British Space Development Co—or for a new outfit, perhaps the Space Hire and Fire Trust (SHAFT). Whilst operating a hired launcher, we could, in addition to learning all about it, concentrate our real creative energy on the *next* generation of space vehicles and not try desperately to catch up with the flintlock rifles of the past.

Naturally we could not expect to get the latest US or USSR wonder-beast. The fact that it would be a hired hack would ensure that it was virtually unclassified. If the wily businessman played his cards skilfully, we might even see the US and the USSR vying with each other to offer the best credit terms or the finest hardware.

Britain's cultural and trade relations with the USSR have never been better. It is not far-fetched to think that, if the USSR showed interest in this most fashionable commercial deal, the USA would be keen to do better. They certainly would if we were an underdeveloped nation. And that is precisely what we and the rest of Europe are when it comes to space travel.

Can we be first for a change? Surely as a nation of shopkeepers we have never lacked entrepreneurial flair?

London EC3 HAROLD CAPLAN

Getting the Gatty Record Straight

WITH reference to Mr Geoffrey Dorman's letter "Aviation 'History'" [August 10], if my memory is not at fault I think he will find that (a) Harold Gatty did not take part in the flight round the world in 1924 to which he refers, and (b) the name of the pilot of the second aircraft mentioned was either Nelson or Wade: I think it was the former.

London W1 EDGAR PERCIVAL

I REGRET to say that Mr Geoffrey Dorman is wrong, too, in naming "Lts Lowell Smith and Harold Gatty" as the first men who flew round the world. In reality, Lowell Smith was accompanied aboard the Douglas Cruiser *Chicago* by Leslie P. Arnold, while the crew of the second aircraft, the *New Orleans*, was composed of Erik H. Nelson and John Harding Jr. Harold Gatty had absolutely no active part in the round-the-world flight of the US Army Air Force in 1924.

Berne, Switzerland ARTHUR FLURY

I TOO can clang! And how! In my letter in *Flight* of August 10 I carelessly wrote that the first flight round the world was made in 1924 by Lts Lowell Smith and Harold Gatty. The second pilot was E. H. Nelson, *not* Harold Gatty. I abase myself for catching clangeritis by watching too much TV!

London W14 GEOFFREY DORMAN

Wanted: RAF Bomber Photographs

MAY I appeal through your columns for photographs of any RAF bomber aircraft in squadron service? I am at present completing a book to be published next year on the RAF's bomber squadrons past (including their RFC/RNAS predecessors and the Commonwealth and Allied units which flew with the RAF during World War Two) and present, and although I have some 1,200 photographs of *squadron* aircraft I still have many gaps to fill.

My list of wants is far too complicated to give here in detail but, to mention just a few, I need photographs of (1) Lancasters of practically all the 1, 3, 5 and 8 (PEF) Group squadrons, (2) Mosquitos of the PFF, (3) Italian—and Far East—based Liberators, and (4) home-based Hawker Hinds, Audaxes, Battles, Blenheims, etc of the "expansion scheme" period. The biggest gaps are in the latter category.

In all cases photographs should show *complete aircraft*, and their squadron markings (when carried) or, at least, the aircraft's serial numbers should be visible.

If any readers can help me, either by loaning negatives or prints for copying, I would be most grateful if they would drop me a line. My book is to be profusely illustrated and there is every chance that their contributions—be they FE2bs, Halifaxes or Washingtons—will eventually appear in print. I shall, of course, take great care of any negatives, etc, and shall return them to their owners with all possible speed.

128 Varity Road,
South Tottenham,
London N15 P. J. R. MOYES

FORTHCOMING EVENTS

Aug–Sept	27–3	Swedish Parachute Club: International Contest, Uppsala.
Sept	1	British Interplanetary Society: Symposium on "Man-in-Space."
Sept	3	Wolverhampton Aero Club: At Home.
Sept	3-14	8th Anglo-American Aeronautical Conference (joint IAS/RAeS/CAI), London.
Sept	**4-10**	**SBAC Exhibition and Flying Display, Farnborough.**
Sept	6	RAeS Rotorcraft Section: Annual Dinner.
Sept	6-10	FAI: European Air Tour.
Sept	9-10	Popular Flying Association: Rally, Fairwood Common, Swansea.
Sept	9	British Air Mail Society: Golden Jubilee Exhibition and Dinner, Windsor.
Sept	11-15	Royal College of Advanced Technology, Salford: Course on Noise Measurement.
Sept	11-17	Battle of Britain Week.
Sept	13-17	German Aero Club: 2nd International Sporting Pilots' Rally, Baden-Baden.
Sept	15	British Interplanetary Society: a.g.m.
Sept	23-24	International Grand Prix for Light Aircraft, Bourges.

Straight and Level

YOU know how airlines announce new services and so forth by putting in very tiny print at the bottom of the advertisement "subject to government approval." Canadian Pacific Air Lines have announced that as from October 7 they will operate a direct service from Vancouver to London. Full details are given, about the type of aircraft (DC-8s and Britannias), days of departure, connections with other CPAL services, and so forth.

In Ottawa the Canadian Minister of Transport, Mr Leon Balcer, confirms that CPAL is designated by the Canadian Government to operate the route. Neither the airline nor the Canadian Minister of Transport mentions that the necessary permission has not been forthcoming from the United Kingdom Government. So far as I can discover, the United Kingdom Government have no intention of granting such permission.

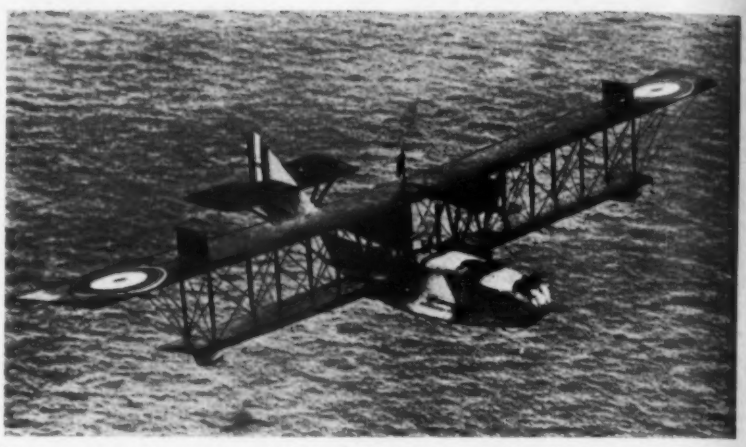
Perhaps the words "subject to government approval" were in such small print that I couldn't read them.

Seriously, the Canadians gave BOAC Toronto last year; shouldn't we now give CPAL London? They have been asking for it for years and years and years, and Grant McConachie does buy British aeroplanes (so does Gordon McGregor).

You know, Commonwealth spirit and all that.

● Talking about Commonwealth spirit and all that, did you realize that no fewer than 12 Commonwealth airline operators have now bought the Friendship? The twelfth customer, announced last week, was East African Airways Corporation. And if rumours I hear that Nigeria Airways are about to order seven Friendships are true, they will be the thirteenth operator to import this Common Market product.

Still, I am glad to say that Boeing, who are about to sell Vertol 107 helicopters to BEA, describe the corporation in *Boeing Magazine* (in a caption to the V-107 flying over Westminster) as British Empire Airways—and, just to show that there is no mistake, they credit the photograph to British Empire Airways.



"There was I—nothing on the sock." [A faithful reproduction of an illustration of a Felixstowe F.2A flying-boat from the book Aerial Transport, *by G. Holt Thomas, published in 1920. Original caption: "Aerial transport over the sea."]*

● "A Boeing 707 turboprop airliner of Qantas flew the 7,000-mile San Francisco to Sydney flight in a record 13hr 44min."—*Sunday Telegraph*, August 20.

"Jet Turns Back: American Super Constellation landed at Shannon early today after turning back because of faulty engine . . ."—*Daily Mail*, August 22.

● Once again an agreement between the USA and the USSR for the operation of reciprocal air services has been postponed because of international tension.

This has happened twice before, I seem to recall. The two sides start to negotiate, reach the point of agreement, and then there is an international crisis and the delegates go home in a huff. Last time the huff was about the U-2 incident.

Obviously, the surest way of avoiding international crises in the future would be for the Americans and the Russians to stop trying to negotiate an air agreement.

● *Flight* staff member: "What shall I call this piece on the Gagarin film?"

Flight colleague: "What about Starrin' Gagarin?"

"No, don't be silly, the Russians would write to us to say that we had omitted the g."

"Well, he was weightless, wasn't he?"

● Britain's airline industry has asked Straight and Level to issue Ministry officials with AOCs—Administrators' Operating Certificates.

In the same way that Air Operators' Certificates are intended to reassure the public of the airlines' competence, so these new AOCs will reassure the public of the competence of Ministry officials. Dr J. Nit will carry out the appropriate interviews shortly

ROGER BACON

I'm feeling sick

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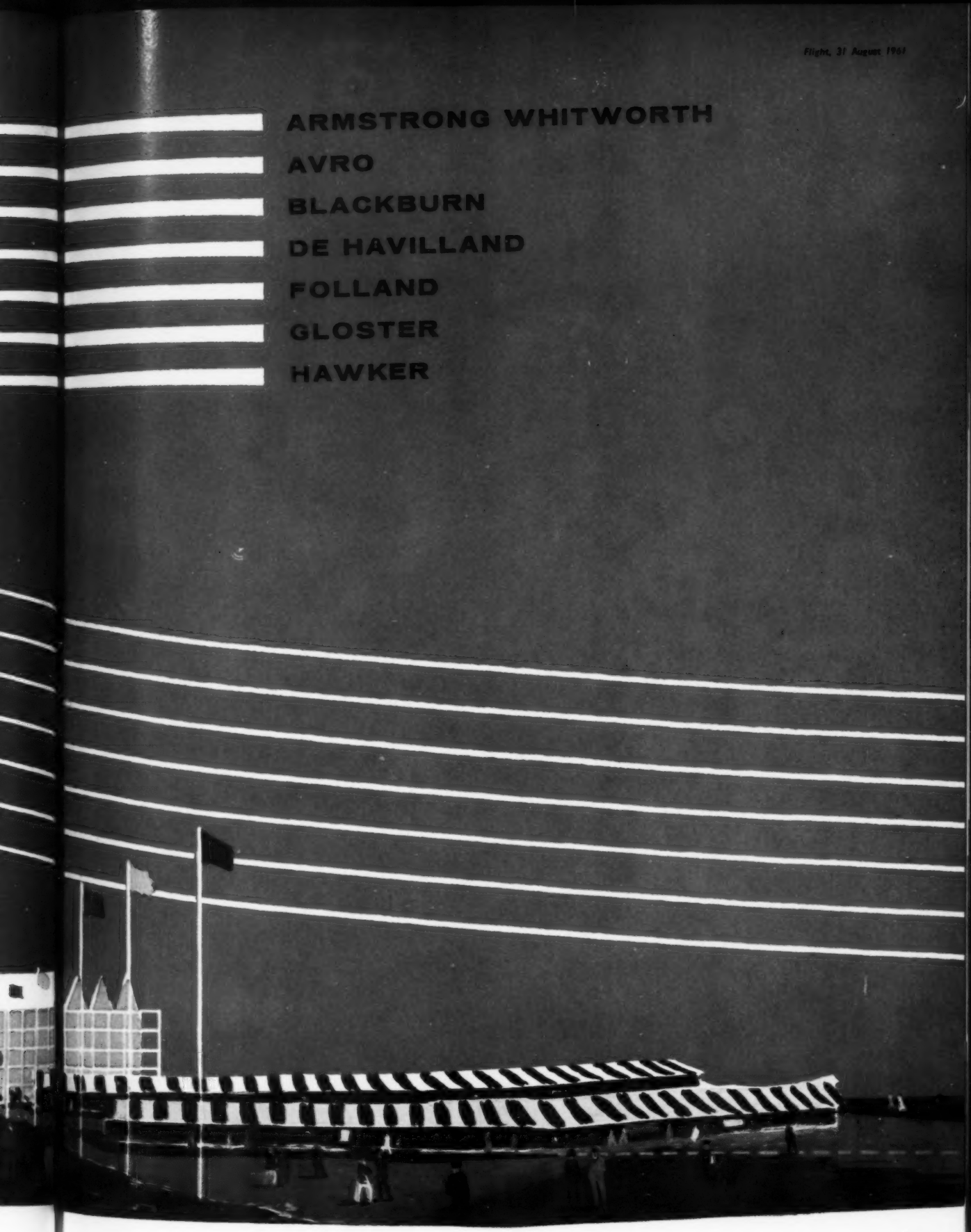

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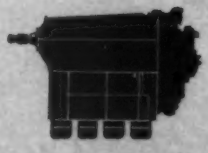
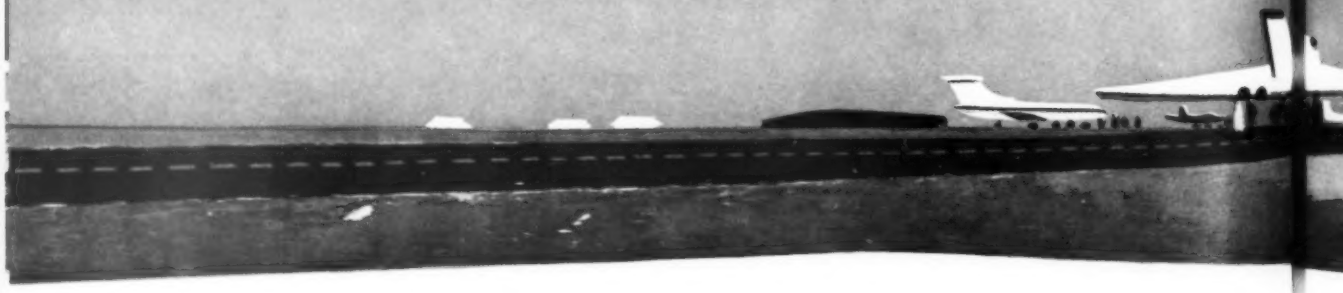
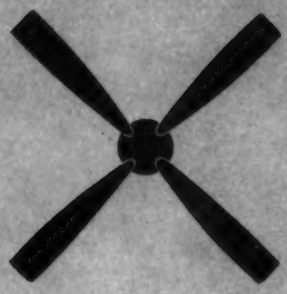




HAWKER SIDDELEY AVIATION

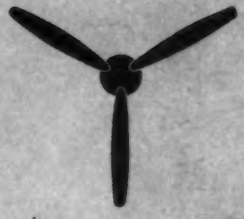
More than a dozen different types of propeller are being developed or are in production for gas-turbine and piston engines, ranging from 200 to 6,000 shaft-horse-power.



These propellers are installed on:

Long-range turbo-prop passenger and freighter aircraft

Long-range maritime reconnaissance aircraft



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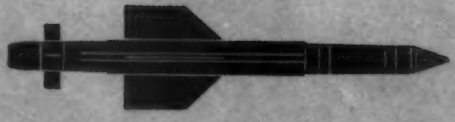

HAWKER SIDDELEY AVIATION

In parallel with aircraft, engine and missile development, Hawker Siddeley Aviation manufacture:

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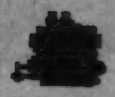

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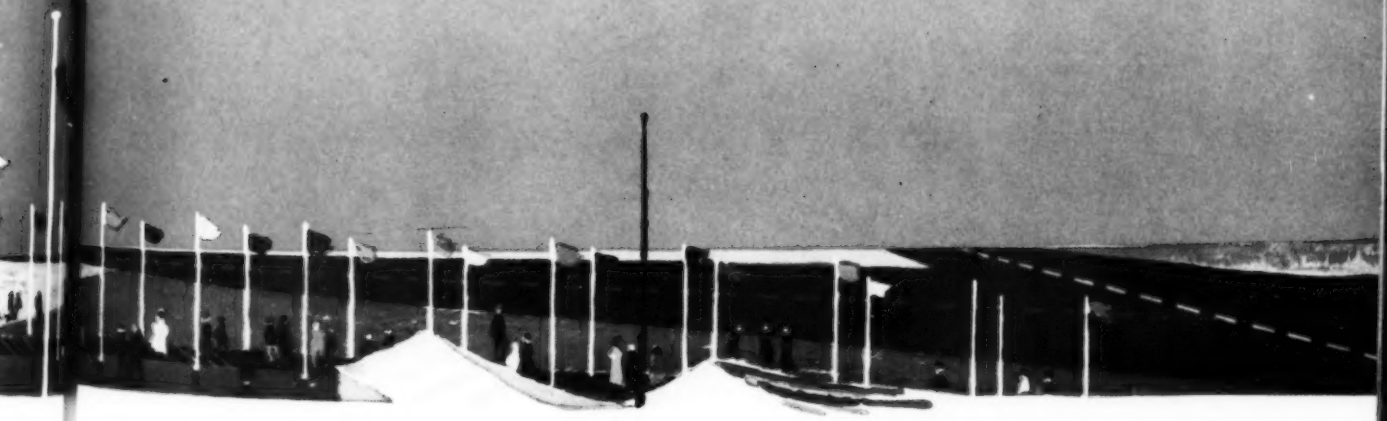

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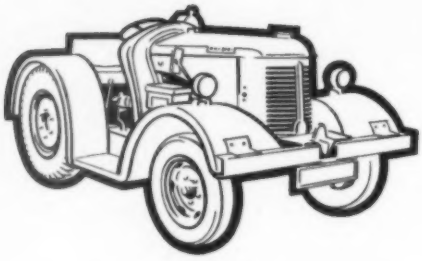

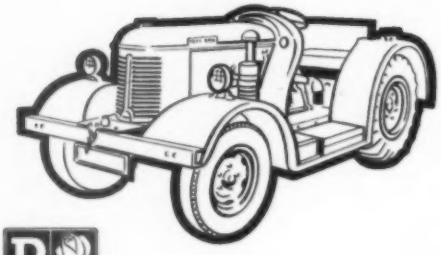

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A. V. ROE & CO LTD (Member of Hawker Siddeley Aviation)

Greengate, Middleton, Manchester. Telephone: Failsworth 2020

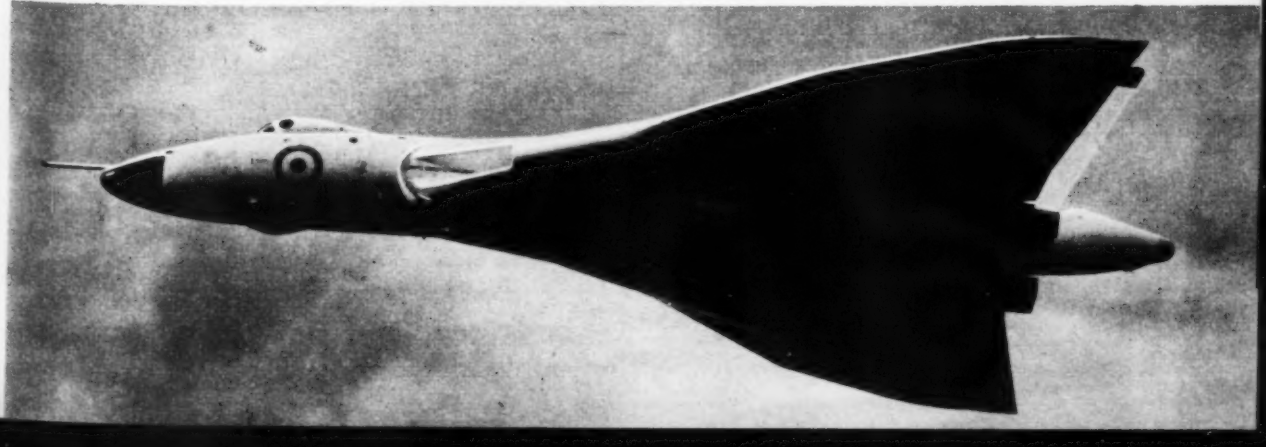
Avro 748 Now nearing the end of its certification flight tests, and due to enter service with the British independent airlines Skyways and BKS next spring, the Avro 748 is Hawker Siddeley's contender for the so-called DC-3 replacement market. Three versions are offered: the Series 1 with the Rolls-Royce Dart 514 (1,740 e.h.p.); the Series 2 with the higher-powered Dart 531 of 2,105 e.h.p. (a version more suitable for operation in hot-and-high conditions); and the 748E, a stretched Series 2. The initial production batch of 12 Series 1 aircraft is well under way, and the first two examples have now flown about 700hr between them. Hot-weather trials were due to be completed as the SBAC display opens.

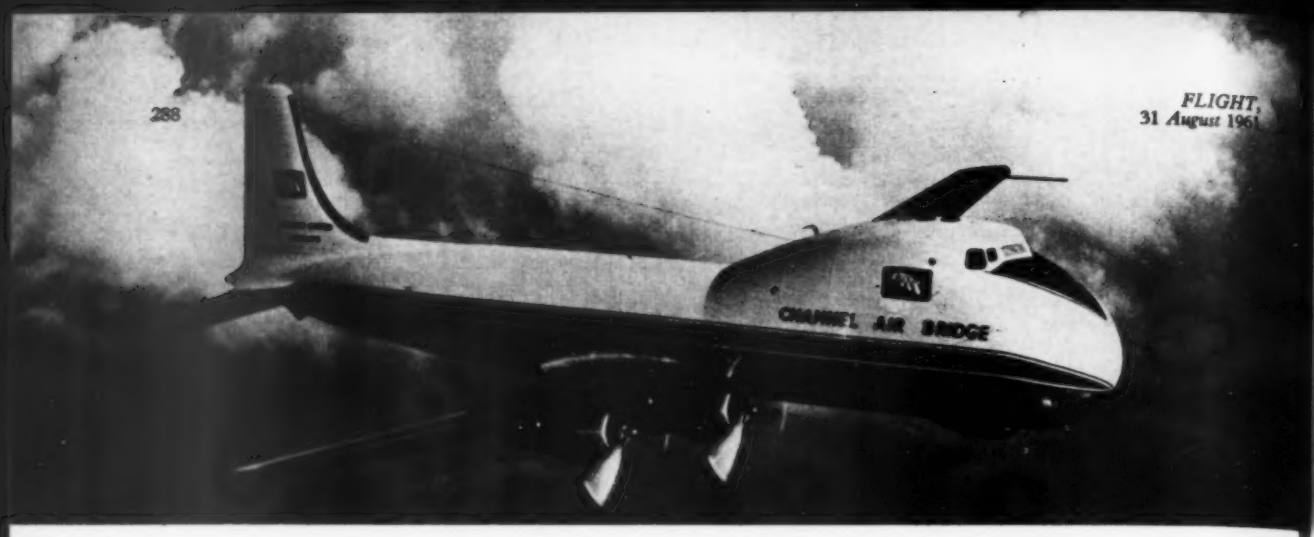
Announced on January 9, 1959, and first flown on June 24, 1960, the 748 has been ordered by Skyways (three Series 1), BKS (five Series 1), Aden Airways (three Series 2), Aerolineas Argentinas (nine Series 1). In addition the Indian Government is building the 748 under licence for the Indian Air Force. Essentially a passenger airliner (although a high-wing rear-loading version is projected for possible military requirements) the 748 (Series 1 and 2) has payload accommodation for 48 seats at 42in pitch. With its maximum payload of nearly 10,000lb, the Series 1 can operate stage lengths, with full fuel reserves, of 580 n.m.; with maximum fuel and a payload of 4,450lb the stage length goes up to more than 1,600 n.m. Corresponding figures for the Series 2 are 1,050 n.m. and 1,760 n.m. Typical cruising speed at 20,000ft at a weight of 32,000lb is 265 m.p.h. for the Series 1 and 290 m.p.h. for the Series 2. Announced in May 1961, the 748E (Dart 531s) has a fuselage lengthened by 6ft, making possible a passenger capacity for up to 60. Payload is increased from 10,000lb to 12,000lb.

Above, Avro 748s

Vulcan B.2 Powered by four Bristol Siddeley Olympus turbojets of 17,000lb thrust each, the Vulcan B.2 bomber (span, 111ft; length, 97ft) has, at previous SBAC displays, demonstrated an extremely high performance in terms of take-off, climb and manoeuvrability. In range and ceiling it is no less impressive, although data may not be quoted. Typical of long-distance flights was a round trip of 8,500 miles, completed non-stop, with in-flight refuelling, in 17½ hr. Designed to carry the Avro Blue Steel stand-off bomb, the Vulcan will later be armed with two Douglas Skybolt air-launched ballistic missiles, which will greatly enhance its striking power. Earlier this year it was announced that a conversion programme for Skybolt was in hand.

Vulcan B.2





Carvair

AVIATION TRADERS (Engineering) LTD

21 Wigmore Street, London W1. Telephone: Museum 7791

ATL-98 Carvair The first of these converted DC-4s has now completed some 70hr flying and should enter service with Channel Air Bridge in December, possibly flying some of the new deep-penetration car ferry routes next summer. Principal alterations to the basic airframe include the addition of a raised flight deck to allow straight-in loading of cars through the nose. Five medium-sized cars or four large ones can be accommodated ahead of a 23-seat passenger cabin. A DC-7 fin has been added to counterbalance the larger nose. The alterations cost £150,000.

BRITISH EXECUTIVE & GENERAL AVIATION LTD (Beagle)

Sceptre House, 169 Regent Street, London W1. Telephone: Regent 7050

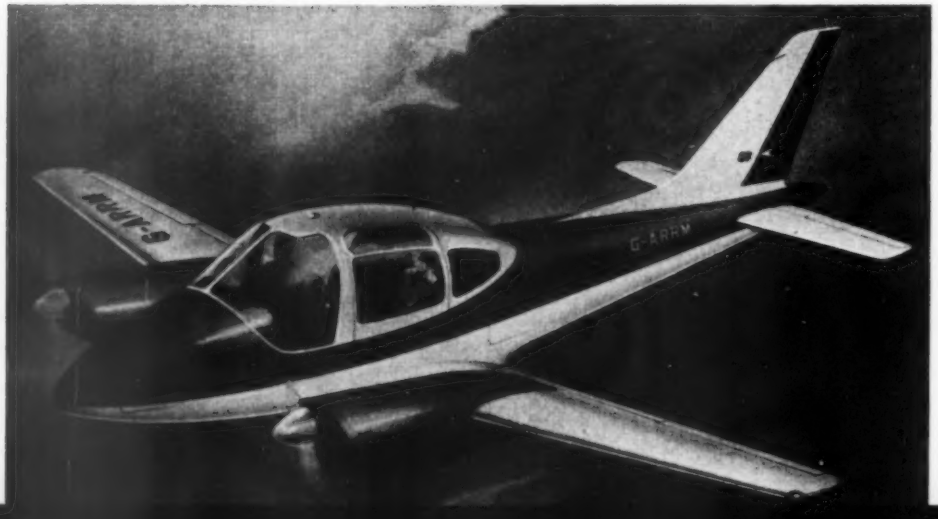
B.206 The prototype of this exciting new executive twin flew on August 15 and achieved the record performance of being granted its special category C of A after only three days and 9¼hr flying, 2½hr of which were by the ARB pilot. With 40° of double-slotted flap extended, the B.206 stalled at an indicated 47kt; and only three degrees of trim change were required from this speed up to 200kt.

A full description and cut-away drawing in *Flight* last week shows how an exceptionally large cabin, with a capacity for up to seven occupants—or five with toilet and washing facilities—has been accommodated in a graceful aircraft. Air-stairs form the doors to the baggage compartment, through which two stretchers may be loaded into the ambulance version. Powered by two 260 h.p. Rolls-Royce Continental IO470 engines with Dowty-Rotol McCauley propellers, the B.206 can cruise at 228 m.p.h. for 1,150 miles with a payload of nearly 1,000lb. Maximum range is 1,720 miles. Zero-wind distance to 50ft is 685yd and initial climb 1,840ft/min. Span is 38ft and gross weight 6,310lb. The price is provisionally estimated at something under £30,000.

The production version will probably be the B.207 powered by 310 h.p. GIO470 engines, which will be quieter and will considerably enhance the already excellent performance.

M.218 A product of the Miles component of the Beagle group, the M.218 is a four-seat small twin, the prototype of which should fly early next summer. It will seat four in a roomy cabin with dual controls and be powered by two 100 h.p. Rolls-Royce Continental O200A engines with feathering Dowty-Rotol McCauley propellers. Other features include retractable wide-track undercarriage with steerable nose-wheel, slotted flaps, v.i. tailplane, baggage capacity and wing-roots only 24in above the ground. Price is forecast as only £5,000. Span is 37ft, gross weight 2,750lb, cruising speed 150 m.p.h., full-load range 645 miles, ferrying range 1,000 miles at 125 m.p.h. with a fuel consumption of only 7.7 gal/hr.

B.206



M.117 Second prospect from the Miles section of Beagle, this two/three-seat, low-wing monoplane is a single-engined version of the M.218, powered by a single Rolls-Royce Continental O200A giving 100 h.p. It will have a fixed or retractable undercarriage with steerable nosewheel, wheel or stick controls, slotted flaps and will be simple and cheap to maintain. Maximum speed will be 123 m.p.h., distance to clear 50ft is 325yd and initial climb 826ft/min. Gross weight will be 1,550lb and fuel consumption 22 m.p.g. The prototype should fly next year.

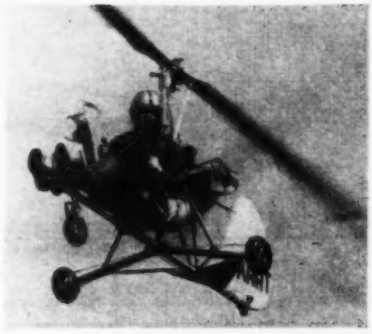
A.109 Airedale The first of the Beagle "pack" to see the light of day, the Airedale was first shown at the Shackleton sales week-end at Coventry in April and several examples are now flying powered by the Lycoming O360 180 h.p. engine. The definitive version fitted with Rolls-Royce Continental GO300 (175 h.p.) and Dowty-Rotol McCauley propeller flew earlier this month. The aircraft represents a clean break with Auster tradition and has front and rear doors, separate lockable luggage compartment, wheel controls, provision for comprehensive radio, comfortable furnishing and extensive sound-proofing, the new, swept Beagle fin and rudder, highly efficient slotted flaps, wheel spats, damped undercarriage suspension and nose-wheel steering and exceptional speed and range performance; and the price of the basic aircraft, which includes many features counted as optional extras in other types, is only £4,750. Cabin layout and controls are functional and simple and the Airedale affords a standard of comfort not yet offered in a British production light aircraft. Controls have also been very carefully developed to provide comfortable but efficient handling. Normal fuel capacity of 32 gal can be extended by optional wing tanks to 52 gal, providing a maximum range of 1,050 miles. Normal range is 650 miles. With four people, 32 gal of fuel and 135lb of baggage the Airedale will clear 50ft in only 400yd. Initial climb is 730ft/min, maximum speed 148 m.p.h., best cruising speed 141 m.p.h. and economy cruise 135 m.p.h. Gross weight is 2,750 lb.

Beagle AOP.11 This outstanding private-venture development of the well-tried Army AOP.9 made its first flight on August 18. The principal innovations are the fitting of a Rolls-Royce Continental IO470 engine and Dowty-Rotol McCauley propeller giving 260 h.p. Power is thereby increased by more than 50 per cent for an increase in gross weight of only four per cent; and engine overhaul life is better by half. The remainder of the AOP.9 structure is relatively little altered, except for the addition of automatic slots. The result is a remarkable improvement in performance. At a gross weight of 2,119lb, with 15 gal of fuel and an endurance of 2.4hr, the AOP.11 has a zero-wind take-off of less than 100yd and can land in less than 70yd. By contrast, maximum level speed is 152 m.p.h., best cruising speed is 148 m.p.h. and initial rate of climb is no less than 1,630ft/min. With 30 gal of fuel the gross weight is increased to 2,550lb, but zero-wind distance to clear 50ft is 268yd and landing distance from 50ft is 203yd.

A.61 Terrier A "pre-Beagle" Auster, the Terrier is a conversion of the Army Auster AOP.6 powered by a 145 h.p. de Havilland Gipsy Major. With an effective silencer and careful cabin sound-proofing and draught sealing, the Terrier is a robust trainer and three-seat club aircraft costing only £1,995.

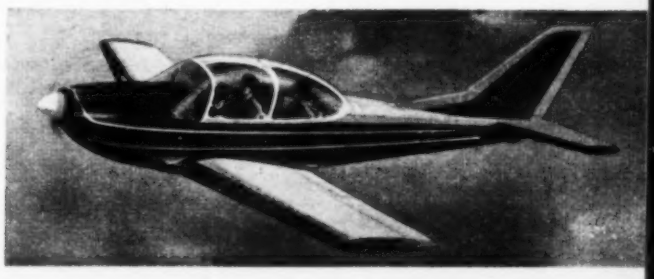
Beagle Wallis WA.116 This simple autogyro is the work of Wg Cmdr Wallis. His extensive development work is now being supported by Beagle and the resulting single-seat autogyro, powered by a McCulloch 70 h.p. two-stroke engine, should, unlike the Benson types, obtain a full C of A. Both civil and military applications are foreseen.

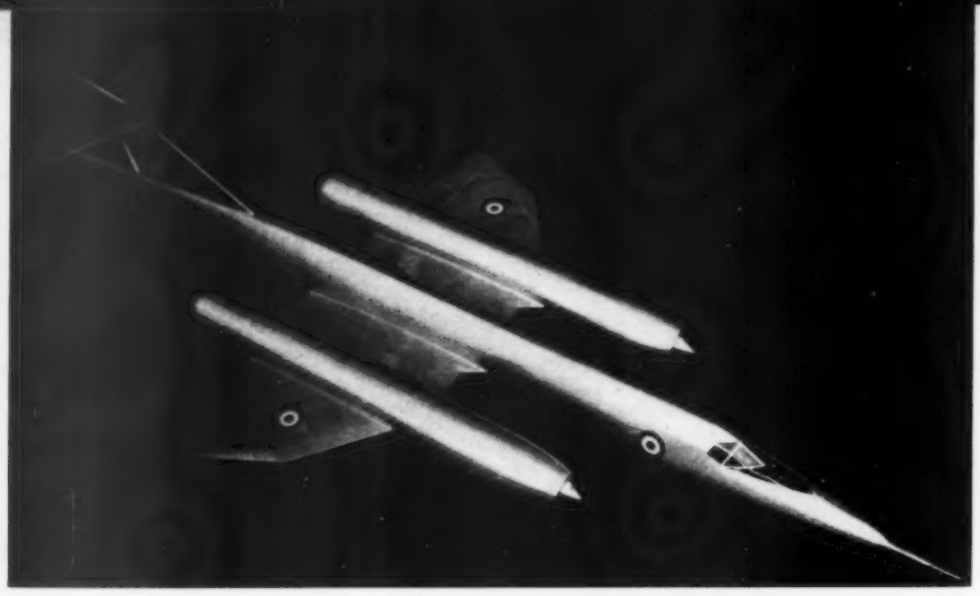
M.218



Beagle-Miles-Wallis M.116

Reading clockwise: Airedale, M.117, Terrier, Mark 11





Bristol Type 188 (model)

BRISTOL AIRCRAFT LTD (Member of British Aircraft Corporation Ltd)
Filton House, Filton, Bristol. Telephone: Bristol 693831

Type 188 Two of these supersonic research aircraft are being built at Filton. Powered by two de Havilland Gyron Junior DJG.10 turbojets with a highly developed reheat system, they are intended for investigations into the problems of flight at more than 1,500 m.p.h., and for sufficient periods to enable steady conditions to be studied, as well as transient phenomena in aerodynamics and kinetic heating. In particular, consideration has been given to research into propulsion developments, and entirely new techniques have been evolved for fabrication in welded stainless steel. The arrangement of the turbojets, seen in the photograph of a model on this page, permits the ready alteration of engine air-intake arrangements and of the variable propelling nozzles at the rear of the afterburners. The main-wing load-carrying portion of each nacelle can, if necessary, be detached from the inner and outer wings and a different size of nacelle substituted. The wing is of modified bi-convex section and is 4 per cent chord in thickness.

BLACKBURN AIRCRAFT LTD (Member of Hawker Siddeley Aviation)
Brough, Yorks. Telephone: Brough 121

Buccaneer S.1 Soon to enter service with the Royal Navy as its standard carrier-borne strike aircraft, the Buccaneer S.1 is powered by two de Havilland Gyron Junior turbojets. Design philosophy is summarized by the makers in these terms: "High-altitude military operations become more hazardous every year, due to radar and missile developments. But radar is not without its limitations, a major one being that it is only effective over line-of-sight distances. This means that not only do hills or other obstructions limit its range, but the curvature of the earth severely restricts its horizon. Radar also suffers at low altitudes from 'clutter', which gives a confusing picture due to ground echoes, which also affect the accuracy of anti-aircraft missiles . . . Thus there is a vital gap beneath the enemy defence network; and this vulnerable region, shallow though it is, must be exploited to the full . . . Certain features which enable the Buccaneer to operate in the very turbulent air near the ground can be revealed. Blackburn designers have worked with structural long life in mind and to achieve the necessary fatigue strength have resorted to considerable use of components machined from the solid and steel fittings."

Buccaneer S.2 This forthcoming version will be powered by Rolls-Royce Spey by-pass turbojets and, according to an American report, should be supersonic.

Buccaneer S.1

Comet 4C

THE DE HAVILLAND AIRCRAFT CO LTD (Member of Hawker Siddeley Aviation)

Hatfield, Herts. Telephone: Hatfield 2345

Comet 4 Of the 63 Comets delivered and on order, 28—all delivered—are Comet 4s. This is the first model of the Comet 4 family, ordered by BOAC (19), Aerolineas Argentinas (six delivered), East African Airways Corporation (three). The type first entered service with BOAC, on the transatlantic route, on October 4, 1958. Now deployed on the corporation's eastern and southern and South American services, BOAC's Comet fleet is averaging a utilization of some 10hr per day per aircraft. Approximately one-third of BOAC's total capacity is now provided by the Comet fleet. Overhaul life of the Comet's Rolls-Royce Avon 524 is now 2,900hr, higher than any other commercial jet, and is expected shortly to be increased to 3,200hr and to 3,500hr in a year's time.

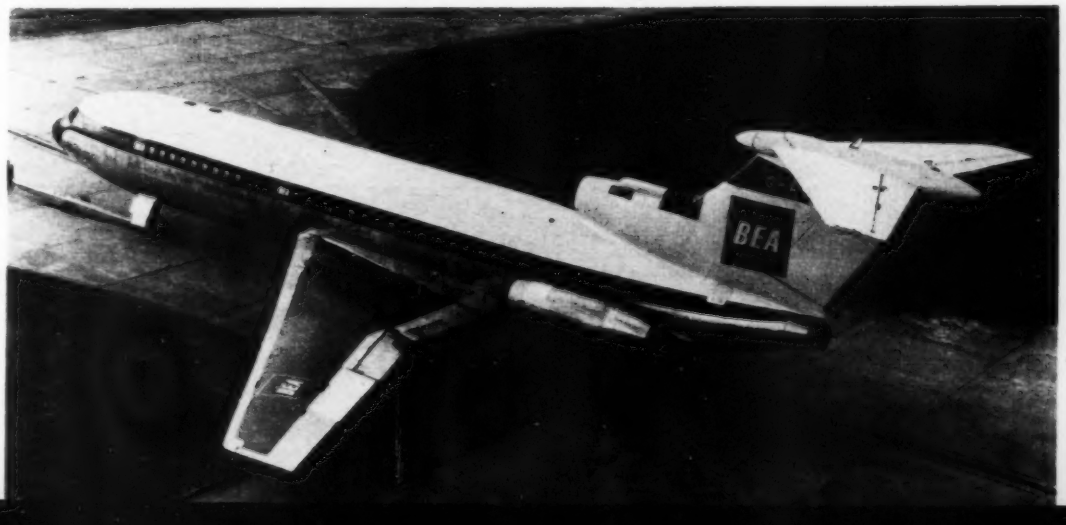
Seating capacity of the Comet 4 is 81 maximum at 34in pitch, or 60 seats four-abreast in the all-first-class arrangement. Cruising speed is 505 m.p.h., using the "best cost" cruising technique; and the range with maximum payload of about 20,000lb, and with full fuel reserves, is 3,500 n.m.

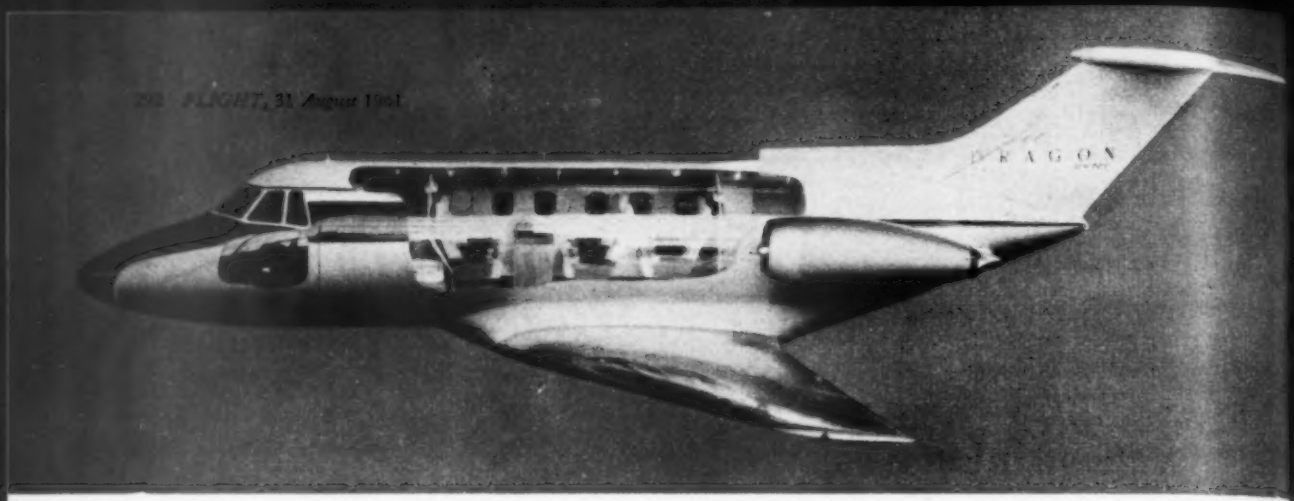
Comet 4B This is the shorter-span, lengthened-fuselage variant for shorter-range continental-type operations. Fourteen have been delivered to complete BEA's present planned fleet. Olympic Airways also operate four Comet 4Bs in consortium with BEA. The type entered regular service with BEA in April 1960, since when it has flown more than 23,000hr. Overall utilization for the fleet is 2,100hr a year per aircraft. To date BEA Comet 4Bs have carried more than 440,000 passengers at an average load factor of about 60 per cent.

Seating capacity of the Comet 4B, which has a 6¼ft longer fuselage than the Comet 4, is 102 maximum. Cruising speed—higher than that of the Comet 4—is 520 m.p.h., using the "best cost" technique; and the range with maximum payload of about 24,000lb is 2,910 n.m. with full reserves.

Comet 4C The intermediate-range version of the Comet family combines the 4B's longer fuselage with the Comet 4's wing and fuel tankage. It thus carries more payload than the Comet 4 over a slightly shorter maximum range. Purchasers of this model are Mexicana (three, of which two are leased to Guest), UAA (five), MEA (four), RAF Transport Command (five). An MEA aircraft is illustrated above.

Trident





D.H.125 Jet Dragon (model)

Trident Soon to start its flight trials, the first production aircraft having been rolled off the assembly line a month ago, the Trident is the first of the so-called second-generation jet airliners. The result of a BEA specification issued to the British aircraft industry in July 1956, the three-engined, triplex-systemed Trident is essentially a jet transport for short-to-medium stage lengths, that is to say from 200 to 1,500 miles. The 24 aircraft ordered by BEA, the first half dozen of which are now well advanced in production, are of the Series 1 version. Already being developed is the Series 2, a project with improved range-payload performance, for a number of which BEA holds an option.

The argument for three engines, which is claimed to be the optimum formula for this class of jet transport, is that it satisfies most efficiently the compromise that has always to be made between the thrust requirements of cruise and take-off—an aircraft of this class tending to be overpowered on take-off with four engines and overpowered in the cruise with two. The rear-engined arrangement confers a wing that lends itself to high-lift devices, and the 121 will have an excellent field performance, take-off field length at maximum weight being 6,000ft. Economical cruising speed will be no less than 585 m.p.h., and peak passenger capacity just over 100.

From the start of design the Trident, with its triplex flying control system (Smiths), is designed for full blind-landing capability. This is to be introduced first as autoflare and then, perhaps by 1970, as full autoland.

Powerplant comprises three Rolls-Royce Spey by-pass turbojets at 9,850lb static thrust each, and ground engine runs in the first aircraft were due to be under way as this issue went to press. First flight is expected to take place in December of this year, and six more Tridents will join the flight test programme during 1962, with deliveries to BEA at the end of 1963, for introduction into service during the summer of 1964. The whole BEA fleet of 24 will be in service by the autumn of 1965.

D.H.125 Jet Dragon One of a number of contenders for the potentially very large executive-jet market, the D.H.125 Jet Dragon was announced last April. Roughly the same size as the Dove, whose executive-travel traditions it will carry on—perhaps for

Dove 8

Heron 2

15 or 20 years hence—the Jet Dragon takes six passengers and baggage and a crew of two. It has a range with reserves of about 1,500 miles. Cruising speed will be 450-500 m.p.h., and (though no figures have yet been given) the aircraft will be able to use short runways and will have a moderate approach speed.

The pressurized cabin is 18ft 6in long, 5ft 10in wide and 5ft 9in high—substantially larger than that of the Dove. Advantage has been taken of the rear-engine arrangement to produce a structurally uncompromised wing, built as a single unit from tip to tip and passing unbroken beneath the fuselage. All fuel is contained within the wings.

Powerplant comprises two Bristol Siddeley Viper 20s of 3,000lb take-off thrust. Flying controls are manually operated; flaps are double-slotted and supplemented with air brakes.

The economic argument for the Jet Dragon as an aid to the busy executive is that, in terms of seat-miles flown per year, productivity is very much higher than that of a piston-engined aircraft. Thus, although the Jet Dragon may cost two and a half times as much to operate as the Dove, its block speed over average stage lengths of about 500 miles is greater in about the same ratio. On the basis of aircraft miles flown, the makers say, Jet Dragon costs will be almost the same as those of the Dove—about 2s 5d per mile.

The only information about target dates is that deliveries can begin in 1963. A batch of 30 aircraft is being laid down. The RAF is likely to be an early customer.

Dove 8 This is an improved model of the well-known light transport that has been in steady production for 16 years; numbers built now approach 550. The Dove 8 has improved performance and range-payload capability, largely by virtue of the higher-powered D.H. Gipsy Queen 70 Mk 3 engines of 400 b.h.p. for take-off. Directed at the executive market, the Dove 8 is known in the USA as the Dove Custom 800. The deeper Heron canopy is fitted and the instrument panel is restyled.

Heron More than 150 Herons have been built, of which more than 80 are in airline service as 14-17 passenger airliners. Now aimed primarily at the executive market, the Heron carries on the Dove's tradition as a popular "corporate-owner" type with a luxurious cabin accommodating eight armchairs.

D.H.126 Still only a project, the D.H.126 is a jet transport which might be described as a "DC-3 replacement replacement." No information has been published, but de Havilland Aircraft have given some details in answer to questions. General layout of the aircraft, which will be twin-engined, conforms with that of the D.H.125 Jet Dragon, though the 126 is of course larger, having accommodation for some 30 seats. The engines will be turbofans (the Rolls-Royce RB.172 has been mentioned in connection with the project). Among the operators who have stated their interest is United Arab Airlines.

Sea Vixen Under the designation Sea Vixen FAW.1 this formidable all-weather fighter (which can function equally effectively as a strike aircraft) was originally ordered in quantity in January 1955. A further order was placed in June 1959 and a third about a year ago. The first British Service aircraft to dispense with gun armament, the Sea Vixen is armed with four de Havilland Firestreak infra-red homing missiles and with 28 2in air-to-air rockets stowed in two retractable fuselage containers. Long-range fuel tanks may be carried in addition to the missiles, and the aircraft is capable of being refuelled in the air by the "buddy" system, i.e., with another Sea Vixen carrying an under-wing drogue-type refuelling pack acting as the tanker. Engines are advanced Rolls-Royce Avons.

Sea Vixen FAW.1

Lightning T.4

ENGLISH ELECTRIC AVIATION LTD (Member of British Aircraft Corporation Ltd)

100 Pall Mall, London SW1. Telephone: Whitehall 1020

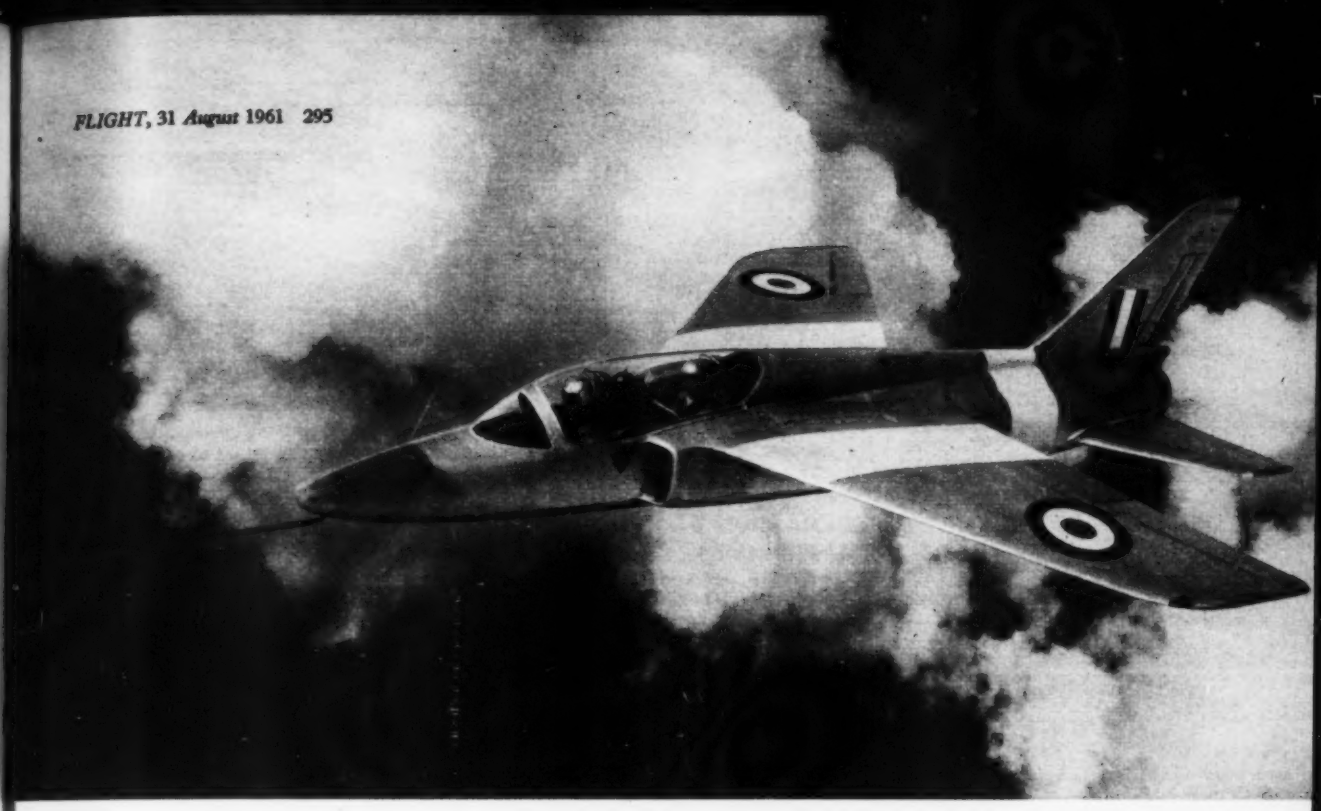
Lightning The current British Service versions of the Lightning single-seat all-weather fighter, now equipping squadrons of RAF Fighter Command, are designated F.1 and F.1A. A very full description of the F.1A, together with a detailed sectional drawing, was published in our issue of July 13 last. This mark of Lightning can be distinguished from the F.1 by the external electrical fairings along the lower-fuselage sides. Earlier this year it was officially stated that the Lightning F.2 and F.3 were in an advanced state of development. It has been surmised that either mark might incorporate the Rolls-Royce RB.146 Avon 300 Series rated at 13,230lb thrust dry, and 17,000/18,000lb with reheat, and it has been officially stated that the Mk 3 is able to carry the de Havilland Red Top missile.

The Lightning T.4 is an operational trainer, with tactical capability, having side-by-side seats. Full dual controls are fitted, and each Lightning squadron is being allotted one or two T.4s for dual checks and demonstrations.

In our July 13 issue we reported that production Lightnings had flown well over 5,000 hours. Our report continued: "More than 50 pilots have flown Lightnings, other than members of RAF Fighter Command, and their eulogistic comments jealously recorded by English Electric Aviation are a remarkable testimony from hard-bitten evaluation pilots. With this aeroplane one can fly and fight automatically at 1,500 m.p.h.; or one can take off in a filthy downpour on a pitch black night along a 2,000yd standard strip; lose an engine at the most inopportune point; complete the circuit; make an approach in a strong cross-wind; touch with full fuel on board, overloaded, and lose the braking parachute (something which is virtually unheard of, as this journal recorded after visiting the first RAF squadron). And after all this, the pilot can climb down the ladder, say 'No sweat at all', and mean it."

The Lightning F.1A has two 30mm Aden guns in the upper fuselage and an armament pack in the under side which can be of any of three types. In all aircraft so far seen in service the pack accommodates equipment for two de Havilland Firestreak air-to-air missiles, which are carried on outboard pylons projecting from the pack, but an alternative pack accommodates two additional Aden guns and their ammunition, while the third arrangement is to fill the space with two boxes each holding 24 spin-stabilized rockets.

Lightning F.1A



Gnat trainer

FOLLAND AIRCRAFT LTD (Member of Hawker Siddeley Aviation)

Hamble, Southampton. Telephone: Hamble 3371

Gnat A development of the single-seat Gnat fighter/bomber, renowned for its performance and manoeuvrability though of relatively low thrust, the Gnat trainer has been adopted by the Royal Air Force as the standard aircraft of its class, in replacement of the Vampire T.11. Powered with a Bristol Siddeley Orpheus 101 turbojet developed with trainer requirements specifically in mind, the Gnat trainer has all-weather capabilities and can carry a variety of external stores enabling it to be used for armament training or for tactical fighter operations. Transonic in level flight, it easily becomes supersonic in a shallow dive over a wide height band. This, the makers remark, affords experience of supersonic flight without the complications and expense of reheat. They further claim that the high performance attained, together with the excellent low-speed handling qualities and exceptional economy, make the aircraft ideal as a lead-in to the modern supersonic fighter. They point out that the airframe is designed for a minimum life of 5,000 flying hours, and this confers without any difficulty a utilization factor of 30-35hr per month —or, indeed, a far higher figure if desired in a training programme.

Possible alternative armament loads are as follows: two 500lb bombs, two 1,000lb bombs—slipper tanks removed, eighteen 3in RPs (25lb warheads)—slipper tanks removed, twelve 3in RPs (25lb warheads), twelve 3in RPs (60lb warheads)—slipper tanks removed, eight 3in RPs (60lb warheads), twelve T10 RPs—slipper tanks removed, eight T10 RPs, two guided bombs, Matra 2in rocket pods, two rocket pods each containing twenty-four 2in British rockets or eighteen 68mm SNEB rockets, Matra 2in rocket pods, two 30mm Aden guns in slipper tanks (112 rounds each gun), two 0.5in Browning guns in slipper tanks (110 rounds each gun), two slipper tanks (59 gal each) plus stores on inboard pylons.

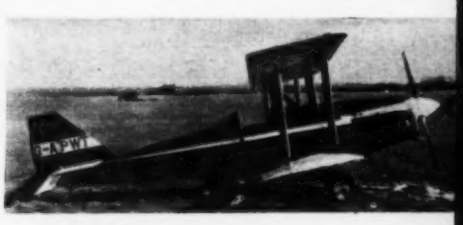
HAMPSHIRE AEROPLANE CO LTD

Southampton (Eastleigh) Airport, Southampton. Telephone: Eastleigh 2368

Currie Wot With experimental development of the turbine-powered version of the Currie Wot completed, using a Rover TP.90 single-shaft gas turbine delivering approximately 70 s.h.p., a 60 h.p. Walter Mikron has been re-installed as the powerplant of this small and attractive biplane. Several aircraft are being built by amateur constructors to Hampshire plans, and the development of the type has included an experimental floatplane version.

Span of the Wot is only 22ft 1in, and normal loaded weight is 700lb. The Mikron-powered version has a maximum speed of 98 m.p.h., a maximum cruise of 85 m.p.h. and a stalling speed of 38 m.p.h.

Currie Wot with Rover gas turbine



Halcyon Construction of the twin-engined four-seat Halcyon should be complete in about two months' time. Initially powered by 100 h.p. Walter Minors, the aircraft will subsequently be fitted with full-power versons of the 120 h.p. Rover TP.90 gas turbine. Aerodynamic work on the project has been carried out by Southampton University, where wind-tunnel tests have indicated a highly promising performance.

With a span of 30ft 5in and loaded weight of 1,700lb, the Halcyon should cruise at 130 m.p.h., stall at 40 m.p.h. and have a maximum speed of 140 m.p.h.

Herald 200

HANDLEY PAGE LTD

Cricklewood, London NW2. Telephone: Gladstone 8000

Herald Now in service with Jersey Airlines, who have a fleet of six of the Series 200s on order, the Handley Page Herald is in production for BEA (three Series 100), Nordair (one Series 200), Maritime Central (one Series 200), and North-South (one Series 100). The two versions of the Herald differ primarily in the length of fuselage. The Series 100 has accommodation for 38-44 seats; and from it has been developed the Series 200 which incorporates a 42in extension to the forward fuselage. This aircraft is suitable for the higher density operations, having capacity for 50 passengers with the usual amenities and cargo space. Maximum seating capacity of this version is 56 if the galley is eliminated. Basically both versions are identical in structure and equipment.

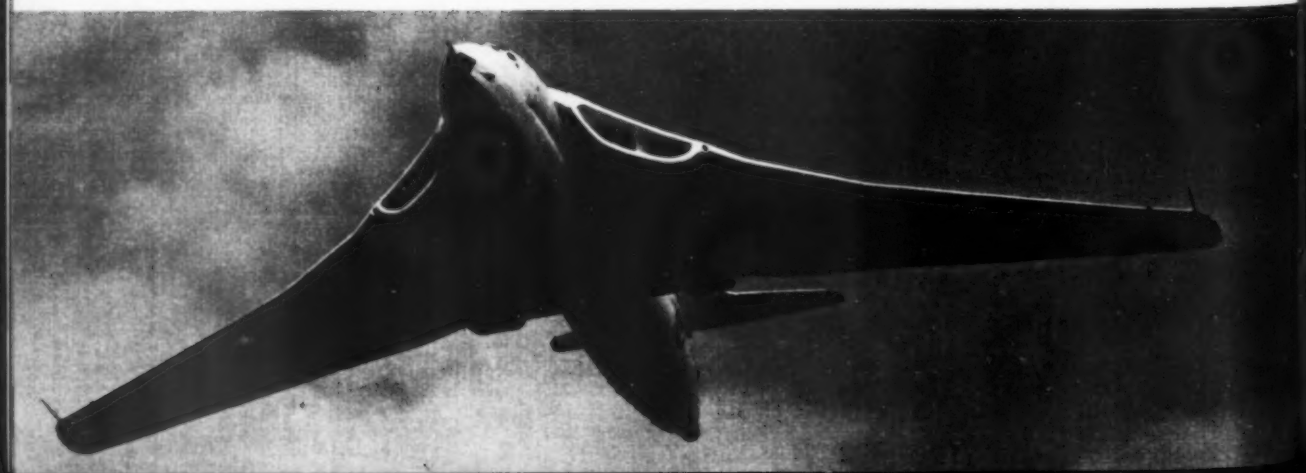
Powerplant of the Series 100 and Series 200 is the Rolls-Royce Dart 527 of 2,100 e.h.p. Maximum take-off weight of each version is 40,000lb, with a maximum landing weight of 39,500lb.

Basic strategy behind the design of the Herald is to enable operators of time-expired aircraft such as the DC-3 to introduce more sophisticated standards of local service operation, and to do so without making special demands on existing airfield and runway facilities. The Herald will fulfil exactly this role next year when BEA introduce three aircraft, ordered by the Ministry of Aviation, for operation on the corporation's Highlands and Islands services. This calls for services to DC-3 airfields which are not suitable for larger aircraft such as the Viscount and which will maintain essential social-service communications dependent on air transport.

Victor B. 2 A developed version of the Victor B.1, extensively employed by the RAF in the strategic bombing and reconnaissance roles, the Mk 2 differs principally in having greater span and in being powered by four Rolls-Royce Conway RCo.11 by-pass turbojets each of 17,250lb thrust in place of the Mk 1's Bristol Siddeley Sapphires of 11,000lb apiece. On entering service with RAF Bomber Command it will be equipped to carry the Avro Blue Steel stand-off bomb. Discussing the Victor B.2 in the reconnaissance role the Air Ministry remark: "Some of the Mk 1 Victors are used for reconnaissance, and the Mk 2 version will also be employed in this additional role. If the aircraft cannot get reconnaissance information by visual or photographic methods, they can get it by radar. Present radar equipment provides pictures from which airfields can be identified and the runways measured. The Victors, with new radar, will be able to cover an area equal to the whole of the Mediterranean in a single radar reconnaissance sortie by one aircraft which could give a count of the total number of ships in the area. A radar map of an area the size of the United States could be made in one sortie by only four aircraft."

The crew of five consists of captain, co-pilot, navigator/plotter, navigator/radio and air electronics officer, occupying a pressurized compartment for operation at above 50,000ft. Power-operated controls provide the heavy aircraft with the feel of a light bomber. In addition to very large under-wing tanks the Victor B.2 has provision for in-flight refuelling.

Victor B.2

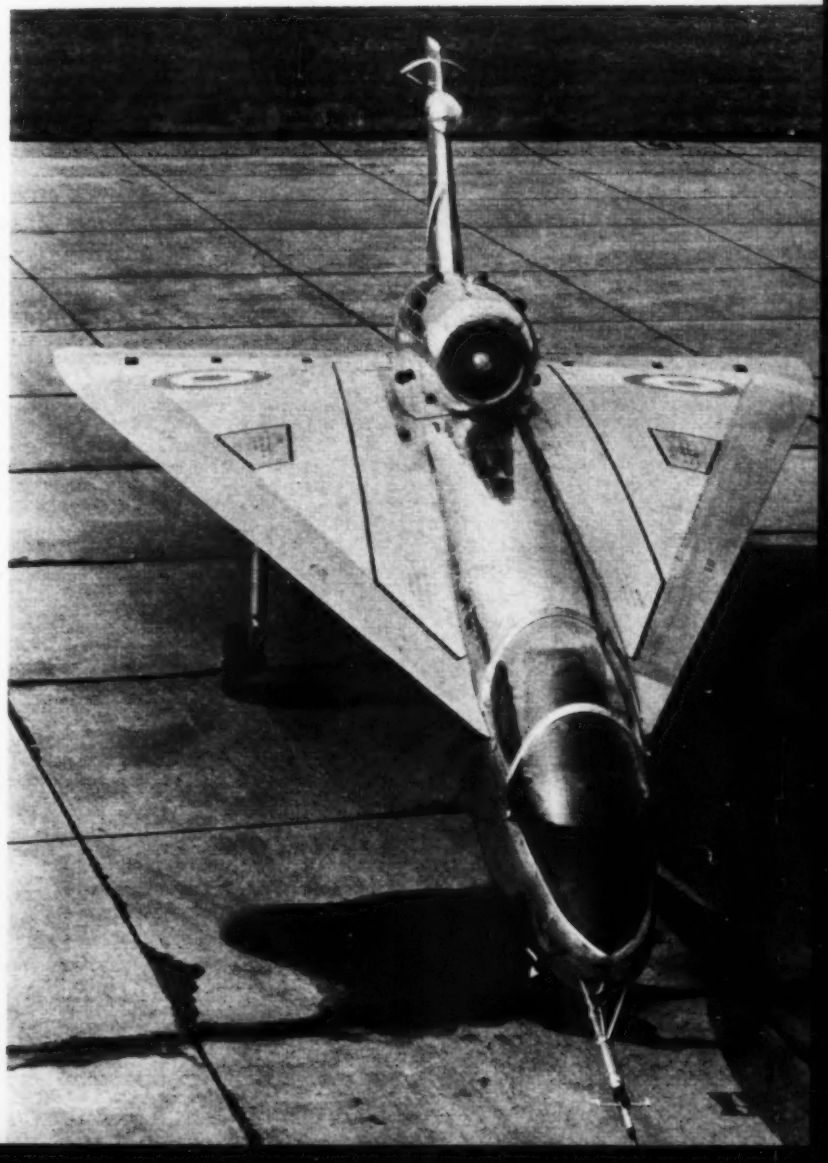


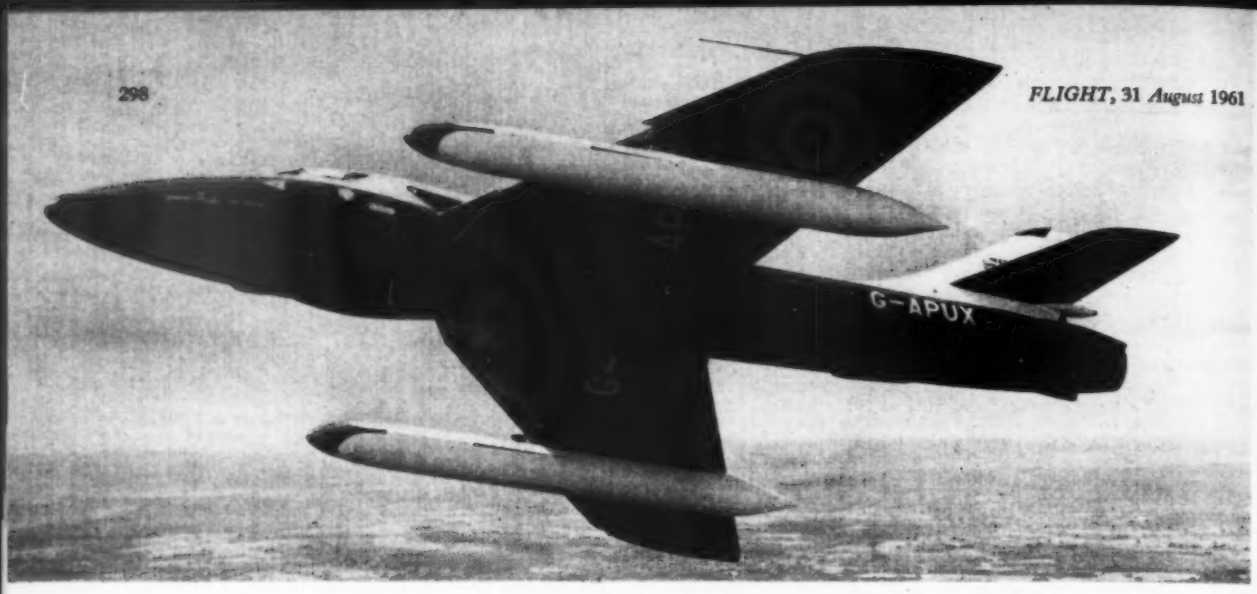
H.P.115 It is hoped that this remarkable research aircraft will put in an appearance at this year's SBAC display. It first flew on August 17 and has been built under contract to the Ministry of Aviation in order to provide full-scale free flight experience with a configuration similar to that which might prove the optimum for a future Mach 2.2 transport. Leading-edge sweep is of the order of 80°, making the aircraft the world's slenderest delta, and a single Bristol Siddeley BSV.9 turbojet is mounted above the rear part of the wing. Since the aircraft is intended to provide answers to low-speed handling problems, the H.P.115 has only a modest performance and a fixed undercarriage. It is significant that the shape of the wing is by no means identical to that which is supposed in this country to be the optimum for the Mach 2.2 airliner. The plan-form is not an ogival Gothic shape but almost a pure triangle, and conical camber appears to be absent. The leading edge is, in fact, detachable, and considerable variations in shape can readily be incorporated. The large trailing-edge control surfaces are simple "elevons", and these appear to be manually operated. Very large perforated air brakes are located on the under surface of the wing, ahead of the under-carriage. The large fairing which projects from the leading edge of the fin will contain a camera for the photographing of the "tufted" port wing. Immediately above the jetpipe is an anti-spin and braking parachute.

H.P.117 This is a project for an all-wing airliner to reduce transatlantic fares by as much as 30 per cent. It would use Handley Page's laminar-flow techniques (for reducing drag by controlling the air flow) and would, the makers claim, offer the most effective way of bringing air travel to the multitude at low cost. The H.P.117 would seat 300. Although the H.P.117 would be subsonic, Handley Page remark that laminarization is still effective at supersonic speed. It could, they say, give a Mach 2.2 airliner half as much payload again on, say, the London - New York route as its unlaminarized equivalent.

Model of H.P.117

H.P.115





Hunter Two-seater

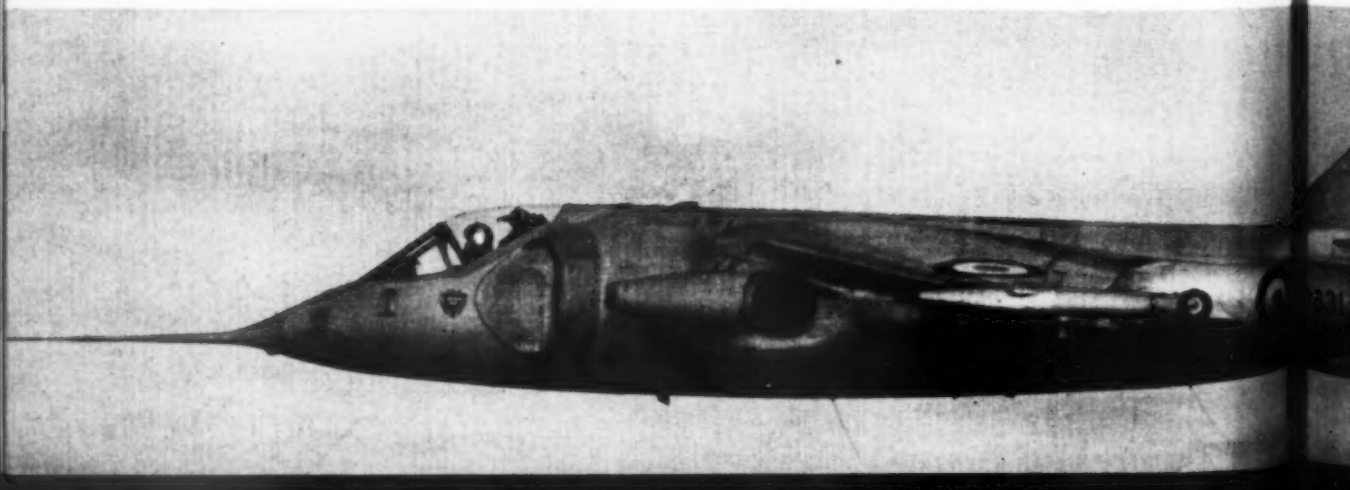
HAWKER AIRCRAFT LTD (Member of Hawker Siddeley Aviation)

Richmond Road, Kingston-on-Thames, Surrey. Telephone: Kingston 7741

Hunter Two-Seater This extremely versatile aircraft—a development of the Hunter single-seater, of which something like 2,000 are in service with a dozen air forces—will again make an appearance in this year's SBAC display. It is offered not only as an advanced and operational trainer, with full dual control, but as an intercepter with an all-weather development potential, a reconnaissance aircraft carrying cameras and guns for tactical work at long range, a ground-attack fighter with uncommon capabilities, a long-range patrol aircraft (or for ferrying duties) with a range of over 1,500 nautical miles, and as an equipment and services-test vehicle, for development and research work on equipment, instruments, ejector seats, etc. The aircraft is available either with the Rolls-Royce Avon of 7,600lb thrust or with a 10,000lb thrust version of the same engine. On inboard underwing pylons it can carry 230-gal or 100-gal drop tanks, 1,000lb, 500lb or 25lb bombs, 2in rocket batteries, 3in rockets or napalm bombs, and at outboard stations additional drop tanks or rocket projectiles. As frequently demonstrated at Farnborough, the aircraft has remarkably good spinning characteristics. With the more powerful Avon the clean aircraft takes off in 1,050yd and lands from 50ft in 1,250yd. A braking parachute reduces the latter distance to 1,000yd. An absolute ceiling of 51,000ft is attainable.

P.1127 This revolutionary vertical-take-off-and-landing strike/reconnaissance aircraft will make its first appearance at Farnborough this year "if the development programme permits". It is a classic example of collaboration between an engine maker—Bristol Siddeley—and an airframe manufacturer. A lift/thrust turbofan known as the Pegasus is fitted, and its four jet nozzles are directed vertically down for vertical take-off and landing. Control is by jet-reaction units at nose, tail and wing-tips. During transition to forward flight the jet nozzles rotate rearwards and the aircraft accelerates forwards with increasing wing-lift component and decreasing engine lift component. The flying controls become effective as airspeed increases. For horizontal flight the jet nozzles are directed fully aft, and when wing-borne the aircraft flies as a conventional fighter. Hovering is made possible by the downward rotating jets, and at overload weights the P.1127 can take off with a short forward run. The airframe is designed to withstand the heavy flight loads associated with low-altitude attacks and possesses a long structural fatigue-resistant life. By operating from small dispersed natural or semi-prepared sites, the makers say, the aircraft can provide support from close up to the battle area.

P.1127



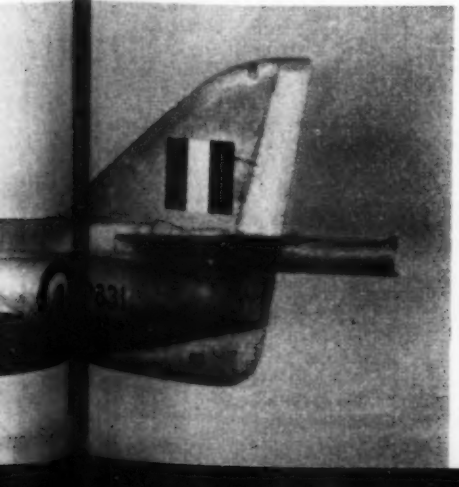
HUNTING AIRCRAFT LTD (Member of British Aircraft Corporation Ltd)
The Airport, Luton, Beds. Telephone: Luton 6060

Jet Provost In the SBAC flying display this year will be a production Jet Provost T.4, and a production T.51 of the Sudan Air Force will be shown in the static park. The T.51 is an armed version of the Mk 3 trainer now operating in large numbers with the RAF. Powered with a Bristol Siddeley Viper 11 turbojet of 2,500lb thrust—a 40 per cent increase over the Viper in the Mk 3—the Jet Provost T.4 can climb nearly twice as fast as its predecessor, which it will soon begin to supplement in RAF service. A height of 30,000ft is attained in 12.5 min, and the makers report that this remarkably improved performance has been achieved without any reduction in endurance or changes in handling characteristics. Maximum speed is 414 m.p.h., and maximum range, with tip tanks, 570 n.m. Introduction of the Mk 4 into RAF service will mark a change in syllabus. "Current RAF pilot training courses", the makers report, "include 230 hours of actual flying. With the Jet Provost Mk 3 only 120 hours of this time was spent in this aircraft and 110 hours on an advanced trainer. With the higher performance Mk 4 this time is being increased to 160 hours at the end of which the pupil will receive his 'wings'. Thereafter, only 70 hours' training is to be spent in an operational trainer. Thus the overall 230-hour course remains, but the transfer of 40 hours to the Jet Provost will place by far the greater part of the training syllabus on this aircraft, and will also mean a notable economy in the cost of qualifying pilots."

The handling qualities and docility of the Jet Provost have frequently been demonstrated at SBAC displays. Last year (issue of April 1) a member of the staff of *Flight* without previous jet flying experience was enabled to try his hand and reported very enthusiastically.

ER.189D The foregoing is the MoA designation of a jet-flap research aircraft now under construction, powered by a Bristol Siddeley Orpheus. The principle of the jet flap is the ejection from the trailing edge of the wing of a "flap" of gas. Work on this system began at the National Gas Turbine Establishment in November 1952. The ER.189D, or Hunting H.126, is the only jet-flap aircraft known to be under construction.

Jet Provost T.3



Top left, Jackaroo

Top right, Prospector

Rollason Condor

(JACKAROO) WILTSHIRE SCHOOL OF FLYING LTD

Thruxton Aerodrome, Andover, Hants. Telephone: Weyhill 304

Jackaroo With over 40 Jackaroo conversions of the venerable Tiger Moth completed at Thruxton, ten of which have now logged 20,000 hours' flying at the Wiltshire School, the company is continuing to build the type to order at a basic price of £1,400.

Paragon Work has begun on the mock-up of the Paragon four-seater, an original Wiltshire design powered by a 180 h.p. Lycoming engine, and the prototype aircraft should fly early next year. Extreme simplicity in construction and in maintenance is the essence of the design. The Paragon will cost about £2,500, and cruise at 120 m.p.h.

LANCASHIRE AIRCRAFT CO LTD

Samlesbury Airfield, Blackburn, Lancs. Telephone: Mellor 666

Prospector The six-seat Prospector 1 powered by a 295 h.p. Lycoming was originally designed by Mr Edgar Percival in 1956 as an all-purpose aircraft particularly well able to meet the agricultural requirements of Australia and New Zealand. The large and unobstructed rear cabin is perhaps the outstanding design feature of the aircraft, which can demonstrate its extreme versatility by performing well in roles such as spraying, dusting, top-dressing and seeding; supply dropping; freight carrying; ambulance work; passenger carrying and communications; photography; and parachute training and glider towing.

PHOENIX AIRCRAFT LTD

Cranleigh Common, Cranleigh, Surrey. Telephone: Bramley 2289

Luton Minor and Major Plans, kits and materials for the Luton Minor and Luton Major light aircraft, powered by engines of 37-65 h.p. and 60-75 h.p. respectively, are the main products of this company. Many amateurs are building these types.

ROLLASON AIRCRAFT AND ENGINES LTD

Croydon Airport, Croydon, Surrey. Telephone: Croydon 5151

Turbulent This attractive French-designed single-seater, powered by Rollason-built Ardem engines ranging from 30 to 40 h.p., has become a familiar sight in air races and at air displays—particularly those of the Tiger Club—throughout the country. Latest models are equipped with an enclosed canopy and wheel brakes, and a new type of cantilever undercarriage has been fitted experimentally. Basic cost is £945 (30 h.p. Ardem).

Condor New this year to the Rollason range, the two-seat Condor proved its mettle last month by completing in gallant fashion the 620-mile distance event in the Royal Aero Club's International Business and Touring Aircraft Competition at Kidlington, where it was the smallest and lightest machine to be entered. Powered by a 75 h.p. Continental engine (subsequent machines will use 90-100 h.p. Continentals), the Condor is the second Roger Druine design to be built by the Rollason company. Cruising speed is 101 m.p.h.

SCOTTISH AVIATION LTD

Prestwick Airport, Ayrshire. Telephone: Prestwick 79888

Twin Pioneer Production of Twin Pioneer 3 STOL aircraft continues at Prestwick and, as a result of maintained interest in this new-series aircraft, future sales prospects are encouraging. Delivery plans to meet the Royal Malayan Air Force order for ten Series 3 general-purpose military Twin Pioneers require the first batch to leave Prestwick at the end of the year, with the second batch following five months later. In addition, modification of all RAF Twin Pioneers and those of De Kroonduif, the KLM subsidiary, to Series 3 standard is currently in hand.

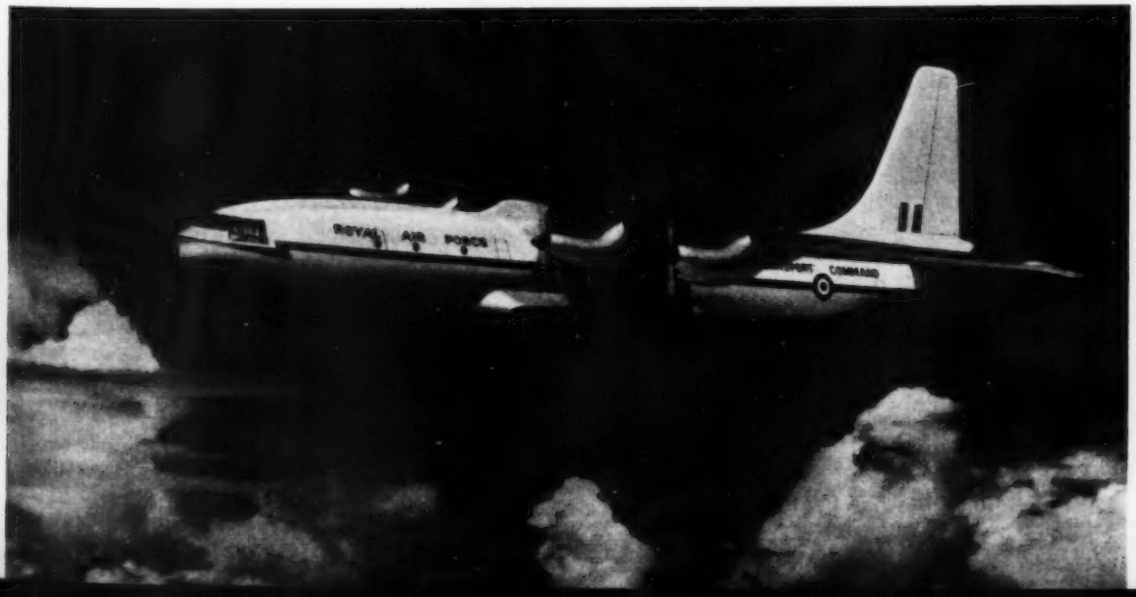
Twin Pioneer Series 3

SHORT BROS & HARLAND LTD SC.1

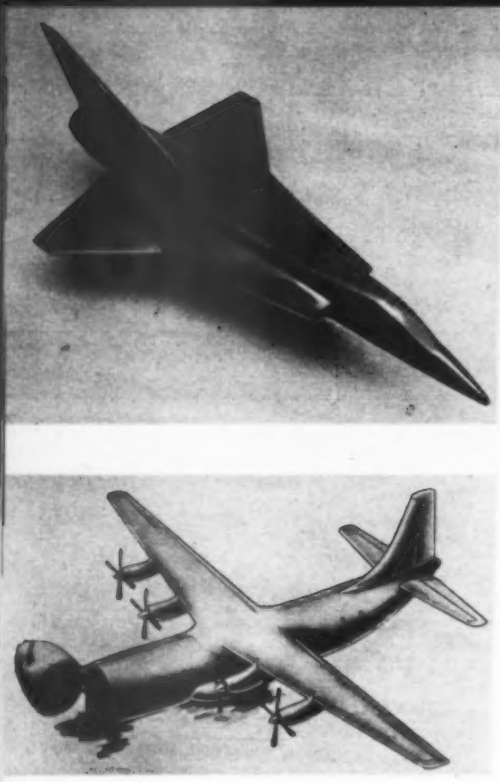
Queens Island, Belfast, N. Ireland. Telephone: Belfast 58444

SC.1 In the SBAC flying display the SC.1 VTOL research aircraft will demonstrate its full cycle of operation—vertical take-off, transition to forward flight, and vertical landing. This aircraft—built under contract to the Ministry of Aviation—has been designed to explore the stability and control problems inherent in jet lift. Short Bros & Harland are handling all design and development work on the aircraft, including the autostabilizer and control systems. These are the responsibility of the company's Precision Engineering Division, working in conjunction with the Royal Aircraft Establishment. The SC.1 is a small delta-wing aircraft with no tailplane. Four of its five RB.108 engines are mounted vertically in a central engine bay and the fifth exhausts horizontally at the tail giving thrust for forward flight. The four lifting engines are mounted in crosswise pairs, each pair swinging on an axis, so that the lifting thrust centre may be directed fore and aft on transition from vertical to forward flight and vice versa. After vertical take-off the engines are inclined backwards to give a forward thrust component and before vertical landing they can be moved forward to give braking thrust.

All five engines have a compressor bleed supplying high-pressure air to a common duct which feeds air nozzles used for stability control in hovering flight. These control nozzles are positioned at the wing tips and nose and tail. Emission of air from the nozzles is con-



Belfast C.1 (artist's impression)



Model of projected VTOL strike aircraft (top) and artist's impression of swing-nose Belfast civil freighter

trolled by the aircraft's electro-hydraulic autostabilizer but the pilot can, when necessary, take over from the system. Other ducts supply compressed air from the thrust engine to the four lifting engines when these are to be relit before landing.

In its present form the SC.1 has no operational application, but experience acquired in its research programme has enabled the company to prepare a number of design studies for VTOL operational aircraft, both military and civil, and these will by typified by exhibits at Farnborough.

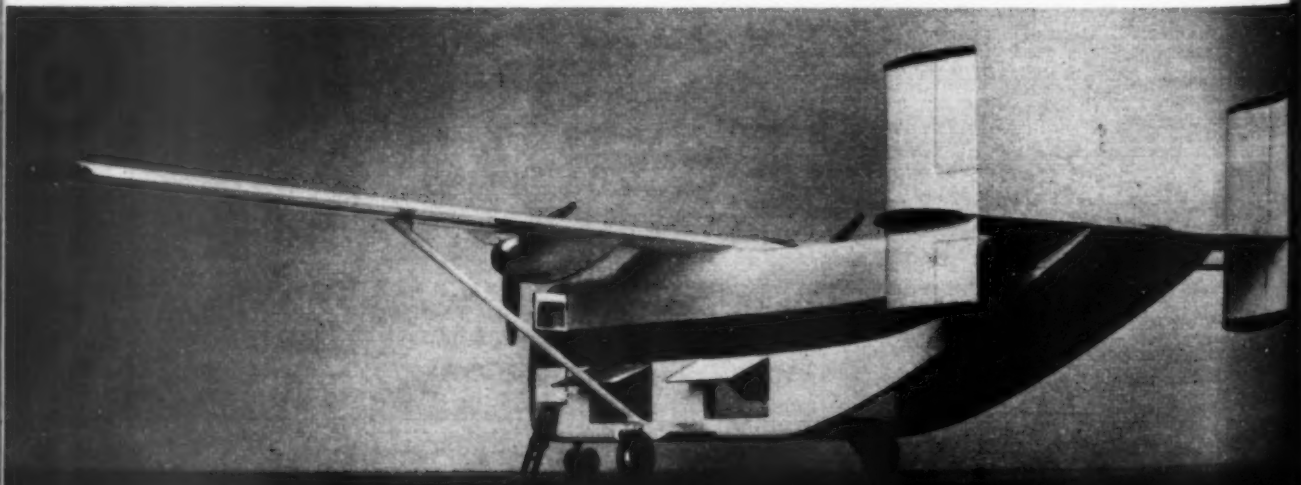
Belfast Three principal variants of the Belfast are at present foreseen. The SC.5/10 is the version on order for Royal Air Force Transport Command and is already in production at the company's Queens Island works. It is powered by four Rolls-Royce Tyne RTy.12 turboprops driving 16ft propellers, has a maximum payload of 85,000lb, a gross weight of 220,000lb, and a maximum speed of 347 m.p.h. The SC.5/20 will be a heavy tactical freighter capable of carrying a very large payload while operating from comparatively small fields. It will be powered by four Rolls-Royce Tyne Stage 5 engines driving 20ft propellers. Gross weight will be the same as that of the SC.5/10. Maximum payload will be 80,000lb and maximum speed 395 m.p.h. The SC.5/31 will be a two-deck civil transport without the rear loading doors of the two previously mentioned variants, but with a hingeing nose for loading and unloading. The makers claim that its adaptability and exceptional payload/range performance will ensure extremely low operating costs. Four Tyne Stage 5 engines are specified and maximum payload and all-up weight will be 100,000lb and 300,000lb respectively. Maximum speed will be 373 m.p.h.

A typical combined cargo and passenger load for the SC.5/31 would be 138 passengers on the top deck, with full amenities, and 55,000lb of "palletized" freight on the lower deck. This version has been designed to carry payloads of 100,000lb non-stop between New York and London. A further indication of the Belfast's freight-hold capacity is a possible load of four Westland Whirlwind helicopters stowed with only their rotor blades and undercarriages removed.

Skyvan The Skyvan is a light freighter now being built as a private venture by Short's Light Aircraft Division. It is regarded as the aerial equivalent of a 30 cwt van and has a main hold measuring 16ft long and 6½ft square. There are no internal interruptions, projections or restrictions, and the rear loading door can be opened in flight for parachute dropping. With 1½ tons of payload the Skyvan, which will be powered by two Continental six-cylinder horizontally opposed engines of 398 h.p. each, will fly for 200 miles at 160 m.p.h. With a 1 ton load the range rises to 900 miles at 140 m.p.h. The floor of the cargo hold consists of removable, stiff panels fitted with combined lashing and seat fixing points. The surface is covered with a chemically inert non-skid layer. When a load is so large that it is impossible to get into the hold and lash it down, access to the lashing points can be obtained through side doors at floor level in the fuselage. Built-in levelling jacks are provided under the rear sill of the fuselage to stabilize the aircraft during loading operations. The structure under the floor is designed to accept, over the full flight envelope, a loading of 300lb/sq ft in the central area (13 sq ft) of the hold; the remainder is designed to accept 150lb/sq ft. With the use of small spreaders, wheel loadings of up to 750lb per wheel can be accepted. The floor itself can accept a load of 300lb on any one square foot. Awkward articles of up to 30ft in length can be accommodated if allowed to overhang into the rear fuselage.

As a passenger transport the Skyvan can accommodate 15 people in seats pitched at 38in. These can be arranged either as lightweight triples or as one row of doubles and one row of singles. The square cross-section and large headroom—6ft 6in over the full width—make it easy for a commuter service to be arranged on which passengers carry their own luggage and place it on the large racks provided. If the two forward doors only are used for passenger entry and exit, part of the space over the rear loading door can be used to fit a toilet and food and drink store if required.

Model of Skyvan



VC10 (model)

VICKERS-ARMSTRONGS (AIRCRAFT) LTD (Member of British Aircraft Corporation Ltd)

Weybridge, Surrey. Telephone: Weybridge 5555

VC10 Now well advanced is the first of 15 VC10s for BOAC which is due to fly early next year. Delivery of the whole fleet of this standard version of BAC's big jet will be made to BOAC in November 1963-August 1964. Other operators who have ordered this version are Ghana Airways (three for delivery in 1964) and British United Airways (four for delivery in 1964). Nigeria Airways will take two of BOAC's 15 standard VC10s.

The standard VC10 will be comparable in speed and payload/range capabilities with the bigger versions of the American jets but, in addition, will have an advantage in respect of airfield performance. The wing, clean from tip to tip because of the rear-engined arrangement, possesses full-span leading-edge slats, and an incidental but commercially important competitive advantage will be the low cabin noise level. Runway for runway compared with the US jets, the VC10 will have a notable advantage in payload/range capability. Maximum seating capacity is 135, six-abreast at 33in. Powerplant comprises four Rolls-Royce Conway RCo.42s of 21,000lb thrust. Maximum take-off weight is 299,000lb.

Super VC10 At this time last year the Super VC10 differed considerably from the aircraft for which BOAC have 30 on order. Basically, the latest (and definitive) Super VC10 is smaller than was projected a year ago, having a seating capacity for 163 maximum compared with 222 then foreseen. The new Super VC10 was announced as recently as June and it will enable the developed high-traffic-density version of the British Aircraft Corporation's big jet to be introduced into the production programme earlier than the original Super. The wing is the same as that of the standard aircraft, having an area of 2,100 sq ft. Fuselage is lengthened by 13ft from 158ft to 171ft—so that the Super VC10 is considerably shorter in length than the version current last year, which had a length of more than 196ft. Powerplant is the Rolls-Royce Conway RCo.42/3 of 22,500lb thrust, and the maximum take-off weight is 322,000lb.

Super VC10 (artist's impression)

BAC One-Eleven (artist's impression)

BAC One-Eleven This jet successor to the Viscount was announced in May 1961, at the same time as an order for ten, plus an option on five, was announced by British United Airways, Britain's biggest independent. Interest in the One-Eleven (two Rolls-Royce Spey turbofans) has also been declared publicly by three US airlines: Continental, Ozark and Frontier. It is essentially a jet successor to the Viscount, being comparable in size and seating capacity to the Viscount 810, but of course having a cruising speed some 150 m.p.h. greater. The One-Eleven springs from the earlier Hunting 107 project, now a BAC project (see below). The aircraft is the first to be tackled by the British Aircraft Corporation as a unified company and is a co-operative design and production effort involving Vickers, Hunting and Bristol. Being intended for short-haul operations—that is to say for stages down to 200 miles—the One-Eleven has a high landing weight in relation to take-off weight. The figures respectively are 65,000lb and 68,250lb. A longer range version of the aircraft is envisaged, having a maximum weight of 73,500lb, this version having centre-section fuel tankage. An airfield capability of 5,000ft to 6,000ft was a basic design target, and a wing area of 980 sq ft—about the same as that of the Viscount—ensures moderate approach speeds of some 2kt less than that of the Viscount. Though not ultra high subsonic, since the economic penalties of drag rise would not be justified in a short-stage aircraft of this class, the One-Eleven cruises at 540 m.p.h. at 25,000ft. Maximum payload of 14,000lb can be carried over stages of up to 700 miles with full fuel reserves and up to 1,250 miles with a reduced payload of about 10,000lb. In terms of cost per aircraft mile the One-Eleven not only competes with the Viscount 810, but is actually cheaper than that aircraft down to stages of below 200 miles. The One-Eleven is the first British airliner to have a rear passenger ventral door, incorporating a hydraulically operated stairway. Maximum seating accommodation, five-abreast at 37in pitch, is 69.

BAC 107 Very little has been published about this aircraft, which is a project only at the present time. It would be the smallest member of the BAC rear-engined jet family, based on two Bristol Siddeley BS.75 turbofans. Depending on market demand, time-scale would be a year or two after the BAC One-Eleven; the engines will be ready earlier.

Vanguard Introduced into full service by BEA and TCA in the spring of this year, the Vanguard is probably the most economic turboprop airliner yet conceived. It is essentially suitable for routes of high traffic density where jet speeds are not a competitive factor. BEA plans to exploit the aircraft fully, depending on the outcome of Air Transport

BAC 107 (artist's impression)

Licensing Board hearings, on the United Kingdom domestic routes. Traffic in this sphere of BEA's operations is increasing rapidly under the impetus of reduced fares.

There are basically two versions of the Vanguard. The Type 951 has the Rolls-Royce Tyne 506 and a maximum weight of 135,000lb. BEA have six of this initial version of the aircraft, the remaining 14 of their fleet being the improved V.953 with increased payload and the same engine. Top maximum weight of this version is 141,000lb. TCA's 23 aircraft are the V.952 which has the more powerful Tyne 512 (5,545 e.h.p. compared with the 4,985 of the Tyne 506). Maximum weight of the 953 is 146,500lb and capacity payload is 37,000lb. Maximum seating capacity of all versions is 139.

Vanguard

Viscount Still in production after nearly ten years, the Viscount is likely to remain unchallenged for a long time as Britain's most successful airliner. The total order book accounts for 429 aircraft. The variant still coming off the line at Weybridge is the larger member of the family, the V.810, which differs from its predecessors, the 700 and 800 Series, in having more powerful Rolls-Royce Darts, and in being faster; cruising speed is 365 m.p.h. About eight V.810s are still to come off the line, against orders from All Nippon, Lufthansa Flugdienst and Ghana Airways.

TSR.2 A contract has been placed for the first batch of this very advanced supersonic tactical support and reconnaissance aircraft for the RAF. The first example should fly early in 1963, and squadrons should receive the type in 1965. It has been disclosed that English Electric had originally designed a low-level aircraft and Vickers-Armstrongs an STOL type. These designs seemed irreconcilable, but the merged teams, now working in the British Aircraft Corporation, managed to combine the two into what is now the TSR.2. Powerplants will be two advanced Bristol Siddeley Olympus.

Viscount 810

Rotodyne prototype

WESTLAND AIRCRAFT LTD

Yeovil, Somerset. Telephone: Yeovil 1100

Rotodyne The prototype Rotodyne, powered by two 3,000 e.h.p. Napier Eland turboprops, is continuing its development-flying programme and will again be on view at Farnborough this year. Designed and built by Fairey Aviation prior to its acquisition by Westland, the Rotodyne is primarily envisaged as a medium-range VTOL transport for city-centre to city-centre operations. The aircraft may be flown as a helicopter or as an autogyro. For vertical take-off the powerplants feed compressed air to the 104ft diameter rotor, which absorbs most of the available power. Extra power comes from four kerosine-burning pressure jets at the rotor-tips. Transition to forward flight is accomplished by progressively transferring power from the rotor to the conventional propellers.

The second Rotodyne, and production aircraft, will be considerably larger than the prototype and will be powered by two 5,250 s.h.p. Rolls-Royce Tyne turboprops. The propulsion system will be the same in principle but considerably modified in detail and the passenger capacity of this version will be 65 compared with the prototype's 40. The company is awaiting an order for Rotodynes for the RAF; initial discussions have been completed with BEA; and there is American interest in the type.

The Tyne-engined production Rotodyne will have an empty weight of 40,150lb, a loaded weight of 58,000lb and an estimated cruising speed of 200-230 m.p.h. It will be capable of carrying 65 passengers or 18,000lb of military equipment, and will have a 109ft rotor diameter, 69ft 5in length, 75ft span, and 27ft 3in overall height. Maximum range will be 702 miles and sea-level vertical rate climb 2,150ft/min.

Belvedere Known originally as the Bristol 192, the tandem-rotor Belvedere should enter RAF squadron service later this year. The Service's trials unit was formed last October, and production of the type to the RAF order is now nearing completion at Weston-super-Mare. The helicopter is powered by two 1,650 s.h.p. Napier Gazelle free-turbine engines, mounted at either end of the main cabin, with a synchronizing shaft along the top of the fuselage enabling one engine to drive both rotors if necessary. In this event

Belvedere

Wessex 1

the changeover to single-engine operation is automatic and takes only 2sec. Single-engine performance is sufficient for the aircraft to return to base and land safely, up to maximum gross weight.

Full dual control is standard, and autopilot and autostabilizer equipment can be fitted if required. The aircraft is fully equipped for night flying, and good performance in high temperatures and at high altitudes is reported. Roles which the Belvedere can handle are listed as troop transport (carrying 19 fully equipped troops), freighting (6,000lb load), casualty evacuation, paratrooping and supply dropping, rescue, reconnaissance, anti-submarine defence, minesweeping and aerial crane work.

In the communications version the empty weight of the Belvedere is 11,530lb and the gross weight 19,000lb. At gross weight its maximum speed is 138 m.p.h., and its maximum range with standard 560gal fuel tankage is 460 miles. Rotor diameter is 48ft 11in, overall length 89ft 9in, length of fuselage 54ft 4in, and maximum height 17ft.

Wessex Based on the Sikorsky S-58, the Wessex Series 1 is powered by a 1,450 s.h.p. Napier Gazelle free-turbine engine, and is in service as an anti-submarine helicopter with the Royal Navy. Capable of carrying both detection equipment and homing torpedoes, the Wessex is able to handle both the search and strike phases of anti-submarine defence. "Modern automatic equipment", the company state, "enables it to operate by day or night in most weather conditions, either from aircraft carriers or shore bases".

A projected civil transport version of the Wessex would have the following performance at gross weight under ISA sea-level conditions: maximum speed 138 m.p.h., maximum cruising speed 132 m.p.h., maximum rate of climb at best climbing speed of 69 m.p.h., 1,750ft/min, service ceiling 14,200ft, range 392 miles (standard tankage) and 645 miles (with auxiliary tankage).

The Wessex Series 2 is a high-performance development of the type employing two 1,250 s.h.p. de Havilland Gnome engines, and is on order for the Royal Air Force. The aircraft will have a transmission limitation of 1,550 s.h.p., the extra power available being used to maintain performance under tropical conditions or at altitude.

Gnome Whirlwind

Scout

Whirlwind Powered by a 1,050 s.h.p. de Havilland Gnome engine, the Whirlwind Series 3 has been developed from the piston-engined (Alvis Leonides Major or Pratt & Whitney R-1340) Whirlwind which in turn was developed from the Sikorsky S.55. Now being built for the Royal Air Force and the Republic of Ghana, the Gnome-powered Whirlwinds will go into service in a variety of roles under the military designation Whirlwind Mk 10.

As a freighter the Gnome Whirlwind can carry 2,000lb, either in the cabin or externally slung; as a transport it can accommodate eight civilian passengers or ten troops. Gross weight is 8,000lb, empty weight 4,694lb, and fuel capacity 177gal (standard) or 287gal (with auxiliary tanks). Performance figures quoted for the civil transport version include: maximum speed, 109 m.p.h.; economical cruising speed, 104 m.p.h.; maximum rate of climb at best climbing speed of 58 m.p.h., 1,200ft/min; vertical rate of climb, 265ft/min; service ceiling 16,400ft; range, 317 miles (standard tankage) or 489 miles (with 110gal auxiliary tank); endurance with standard tankage, 4hr 15min.

Still available at Yeovil is the piston-engined Series 2 Whirlwind.

P.531 Scout This 5/6-seat general-purpose helicopter powered by a Blackburn Nimbus free-turbine engine rated at 1,050 s.h.p. is designed to combine small dimensions, good payload/performance characteristics, good manoeuvrability and operational versatility. It is fully equipped for day or night operation in most weather conditions. The version now on order for the British Army is designated Scout.

The P.531 has also been evaluated by the Royal Navy, and a production order is anticipated. A civil version, known as the Wasp, is also available. Length, height and rotor diameter are 40ft 2in, 10ft 11in and 32ft 3in respectively, and the machine weighs 2,993lb empty and 5,000lb loaded. Under ISA conditions at 5,000lb gross weight, the following performance figures are quoted: maximum speed, 138 m.p.h.; cruising speed, 132 m.p.h.; maximum rate of climb at best climbing speed of 58 m.p.h., 2,000ft/min.

WHITWORTH GLOSTER AIRCRAFT LTD (Member of Hawker Siddeley Aviation)

Baginton, Nr. Coventry. Telephone: Tollbar 2261

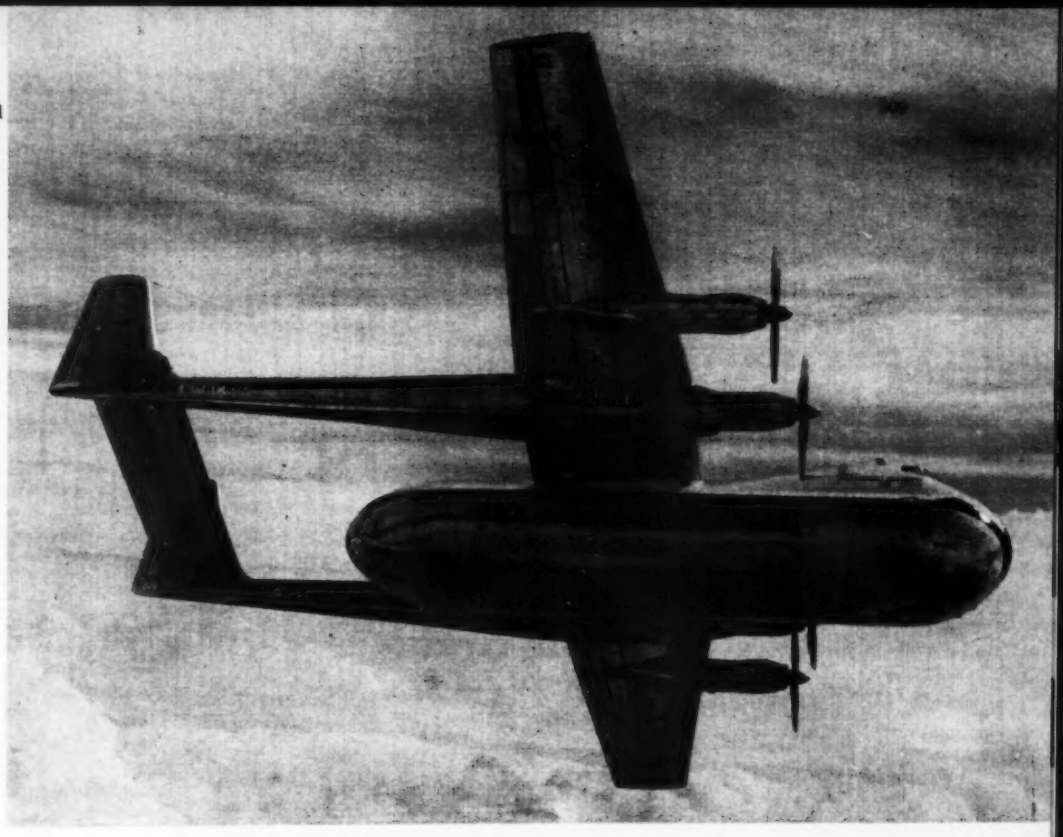
AW.670 Airbus

AW.650 Argosy This version of the Argosy (four Rolls-Royce Dart 7/2 turboprops) is described by the makers as a "freightercoach", signifying its suitability for freight and/or passenger operations. It is in full service with the American operator Riddle Airlines Inc, and after only seven months is already achieving utilizations of over ten hours a day. By September, each of the Argosies engaged on Riddle's "Logair" operation on behalf of the USAF will be achieving over 13 hours' flying a day. The first deliveries to British European Airways are scheduled for the end of the year.

The Argosy has been designed to reduce cargo rates and to cut ground-handling costs and turn-round time to a minimum. The makers claim for the aircraft these advantages: simultaneous double-end loading; a freight hold 47ft long, 10ft wide and 6ft 8in high—unobstructed from end to end; lorry-level loading; a unique quick-loading system ("Rolamat"); full pressurization and air-conditioning; and ground-level refuelling and defuelling. The "Rolamat" system is simple and cheap and has already been proved in service for palletized cargo. It can be fitted in a few minutes to any standard lorry.

The Argosy can carry eight tons of freight in the front fuselage and 38 passengers in the rear, with toilet and galley facilities; or in an all-passenger role it can seat up to 89, six abreast. In these contexts particular advantages claimed are quick-release bulkhead for variable passenger/freight accommodation; tuck-away seats which fold into the fuselage sides; rapid role conversion from freight to passengers or vice versa; no freight restraint barriers necessary; and simultaneous loading of passengers and freight. A typical cruising speed is 280 m.p.h., and it has a range, with a 20,000lb payload, of 1,610 miles. Gross weight is 88,000lb and landing distance 3,120ft.

AW.660 Argosy C.1 In a developed form, under the designation Argosy C.1, the basic "freightercoach" is on order for the Royal Air Force. "Clamshell" rear doors are fitted (in contrast to the starboard-hingeing rear end of the AW.650) in order to provide for rapid vehicle loading and the dropping of heavy "palletized" equipment. The floor



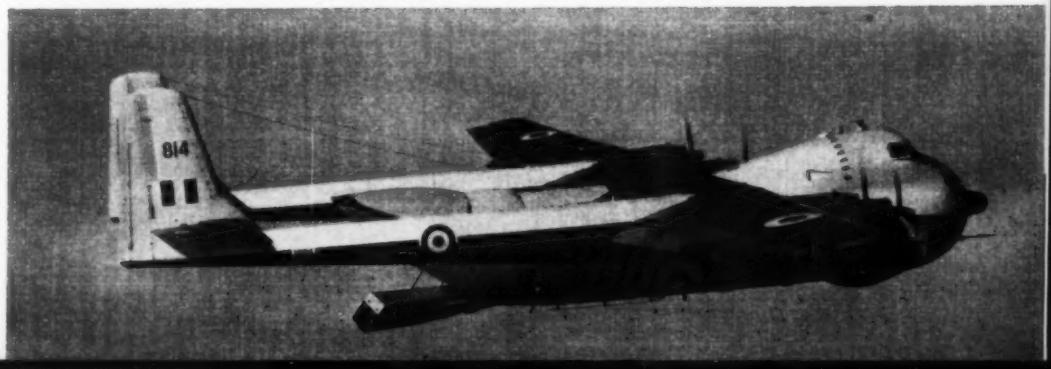
AW.650 Argosy

has been strengthened, port and starboard paratroop doors are incorporated, and special navigational and other equipment is provided. The Argosy C.1 is both heavier (gross weight 97,000lb) and more powerful than the civil machine, the Rolls-Royce Darts being of the RDa.8 Mk 101 type. As a freighter the 660 can carry up to 29,000lb, the limiting factor being the maximum landing weight. Capacity of the hold is 3,860 cu ft; usable length is 46ft 10in and minimum cross-sections are 8ft 6in high by 8ft 8in wide at the sill of the rear door and 6ft 8in high by 10ft wide at the floor beneath the wing. The hold is disposed evenly ahead of and behind the c.g., and, since the position of the latter can vary through some 30in, loading problems should not normally arise. As a troop-transport provision is made for 71 fully equipped men, in twin and triple seats, each provided with a large holster for personal weapons. Kit-bags are stowed on the lower rear door, luggage in overhead racks, and there is a completely equipped galley in the nose.

AW.670 Series The names Air Ferry and Airbus are applied to two variants of the AW.670. Basically the type is an Argosy, but having a wider, more capacious fuselage with double-end loading but with the additional feature of two decks. Although fully air-conditioned, it is unpressurized. In the Air Ferry version passengers are carried on the upper deck and cars on the lower deck. In the Airbus passengers are seated on both upper and lower decks, where very large windows—comparable with those in modern coaches and railway carriages, the makers say—give them panoramic views. The Air Ferry, which may have to land and take off as frequently as every 20 minutes throughout the day, has a fixed and faired main undercarriage, but in the Airbus version, which is expected to operate over slightly longer routes with less frequency of landing and take-off, the main under-carriage can be retractable.

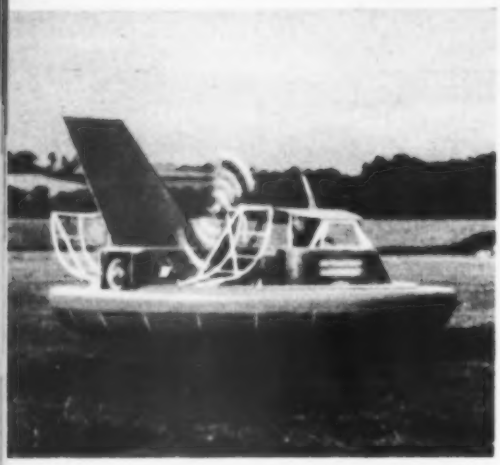
Javelin The Gloster Javelin two-seat all-weather fighter (two Bristol Siddeley Sapphire turbojets) is now out of production, although still very extensively employed by the Royal Air Force. At Farnborough this year the Javelin will be seen in the role of engine test-bed —fitted with two de Havilland Gyron Junior turbojets with reheat. These units are of the type installed in the Bristol 188 supersonic research aircraft.

AW.660 Argosy C.1

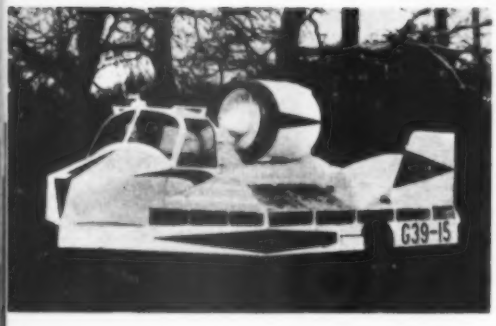


Ground-effect Vehicles

Denny Hovercraft

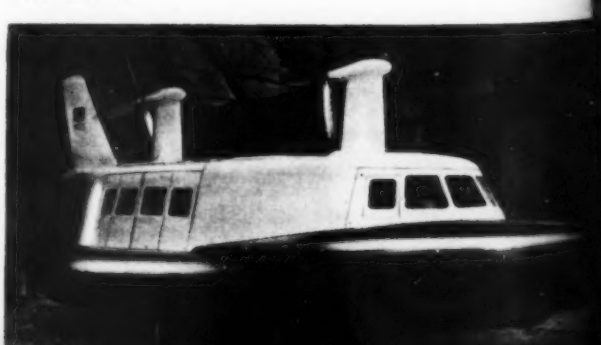


Britten-Norman CC-1



Folland GERM

Westland SR-N1



Westland SR-N2

BRITTEN-NORMAN LTD

Bembridge, Isle of Wight. Telephone: Bembridge 126

CC-1 This vehicle, the company's first Cushioncraft, has now completed approximately 30 hours' testing, primarily on control and stability aspects, at Bembridge. The information provided by these tests has been used in the design of a second air-cushion vehicle, the CC-2.

CC-2 A new fan system is employed in the design of this ten-seater Cushioncraft, which is powered by a Rolls-Royce V-8 engine. Construction of the CC-2 is almost complete, and the company plans to release further details following the first flight.

WILLIAM DENNY & BROS LTD

Dumbarton, near Glasgow. Telephone: Dumbarton 97

Sidewall Hovercraft This 4½-ton machine is a test vehicle to investigate the performance of the sidewall hovercraft layout for larger trading vessels capable of operating at about 35kt in rivers and estuaries. Measuring 60ft x 10ft, the vehicle has two 25 h.p. Excelsior Seafarer 3 two-strokes (lift) and two 35 h.p. Mercury outboards (propulsion).

FOLLAND AIRCRAFT (Member of Hawker Siddeley Aviation)

Hamble, Southampton. Telephone: Hamble 3191

GERM The prototype GERM (ground-effect research machine) is now being re-engined with a four-cylinder Coventry Climax engine to provide increased power for further development trials. The Folland company is also continuing its experimental work on smaller ground-effect machines, including an air-supported stretcher carrier.

VICKERS-ARMSTRONGS (South Marston) LTD

South Marston, Swindon, Wilts. Telephone: Stratton St Margaret 3241

VA-1 Weighing 3,300lb and operating at a hover-height of 4½in, this research vehicle commenced tests last year. Since then several different lift-curtain systems and stability devices have been incorporated and investigated, and the addition of a cabin and fairings has increased the weight to 3,500lb at a hover-height of 4.1in.

VA-2 This five-seat utility craft, designed to have a speed of 40kt and an endurance of 1½hr, is being built primarily as a demonstrator for larger types. It is powered by three light-aircraft piston engines, two for lift and one for propulsion, and the hover-height over a solid surface is 8½in. Dimensions: 28ft 4in long, 14ft 10in wide and 10ft 4in high.

VA-3 Now under construction as a ten-ton vehicle able to carry 24 passengers and crew, or 4,000lb of cargo plus crew for 80 n.m. at high speed, the VA-3 is designed to use four Blackburn Turmo turbine engines for lift fans and propulsion, although other types of powerplant are possible. Dimensions: 52ft 6in long, 25ft wide, 17ft 9in high.

WESTLAND AIRCRAFT LTD (Saunders-Roe Division)

Osborne, East Cowes, Isle of Wight. Telephone: Cowes 2211

SR-N1 Three development phases have now been completed by this pioneer British hovercraft, in its Mk 1 (Alvis Leonides), Mk 2 (Leonides plus Blackburn Marboré for propulsion) and Mk 3 (Leonides plus Bristol Siddeley Viper for propulsion) versions. Owned by NRDC, the machine is now being modified in preparation for a fourth test phase.

SR-N2 Now being built at Cowes, the 66-passenger SR-N2 is due to be completed by next spring. It is intended primarily for operational research and to enable operators to gain hovercraft experience. Power will come from four Blackburn Nimbus free turbines developing 3,000 h.p. and driving two lift fans and two propulsion propellers. Overall length is 64ft, gross weight 27 tons, payload 14 tons, range 200 n.m. and cruising speed 70kt.

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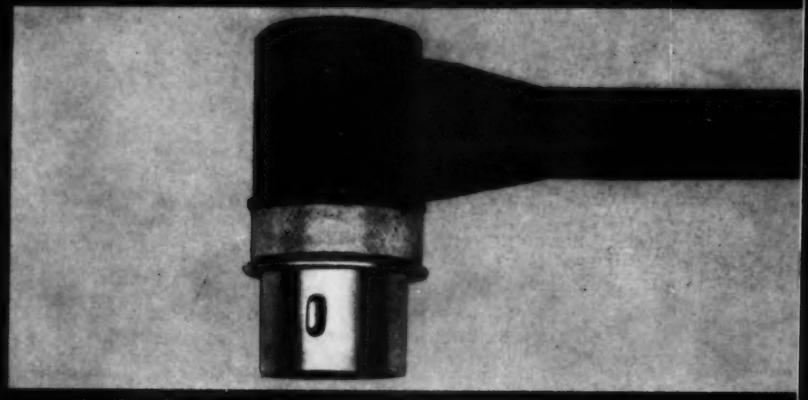

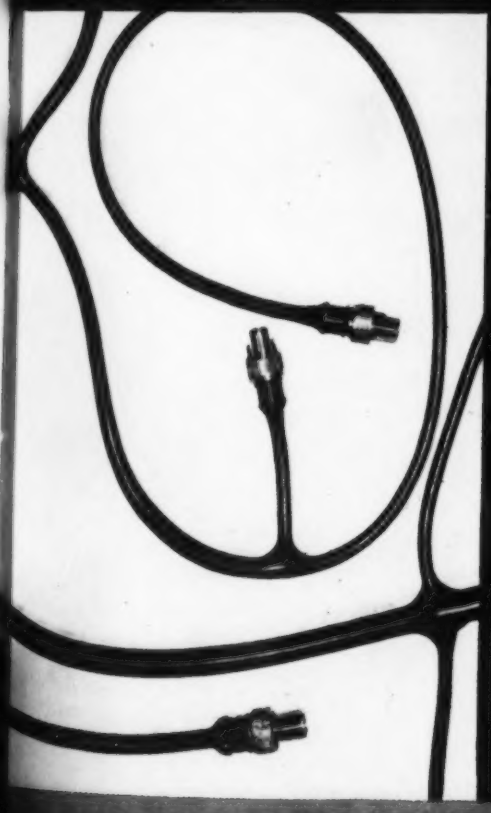

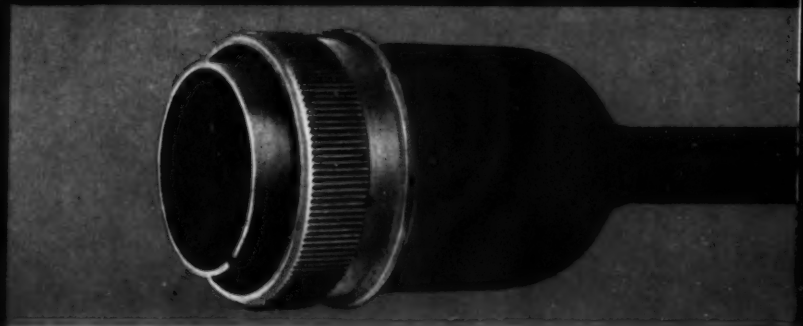

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Know your airports . . . 3

WHAT'S POETIC ABOUT PRESTWICK?

What has Prestwick in common with Scotland's national poet?
The airport is located in the midst of the Ayrshire countryside, immortalised by Robert Burns. The present terminal building, formerly the Orangefield Hotel, was once a private mansion where, more than 150 years ago, the poet was entertained. And although Prestwick is now Britain's No. 2 trans-Atlantic airport it remains as characteristically Scottish as the works of Burns himself.

How long has it been a trans-Atlantic airport?
Since 1941, when construction of the existing main runway began. Prior to that time it had been a grass aerodrome since 1935 when it was built as the airfield for Scottish Aviation Limited. But early in World War II the aerodrome's reputation for good weather became widely recognised and Prestwick was adopted as the U.K. terminus of the trans-Atlantic ferry route. Traffic increased steadily so that by the end of the war some 37,000 aircraft had passed through on the ferry route alone.

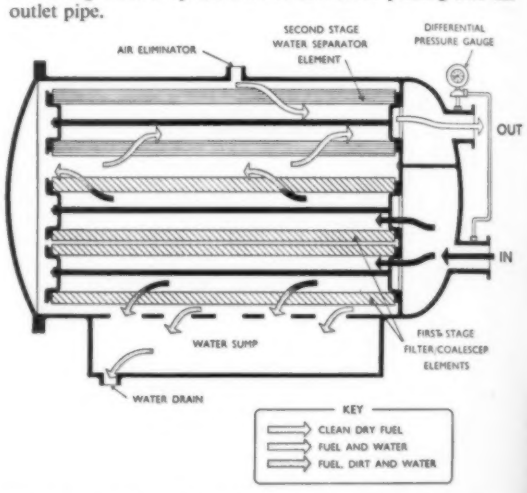
Is there any Service traffic today?
Yes. Not only is Prestwick a busy international airport but it also handles a considerable volume of military transport traffic. The Military Air Transport Service of the USAF has a large base on the airport and an Air/Sea Rescue Unit, including helicopters, is also located there. So at Prestwick Esso helps to meet both civil and military requirements by means of a flexible organisation adapted to the needs of each with swift safe service as the common factor.

How does Esso ensure safe service?
By thorough training backed by extensive first-hand experience. By unsurpassed research facilities. And by a strict system of quality control applied right down the line from refinery to airport bulk storage, from bulk storage to refuelling equipment and from refuellers into the aircraft tanks. A system which includes the stage-by-stage check of samples such as those shown below.

What do these samples show?
These are two test specimens of aviation turbofuel, one taken upstream and the other—the "clear and bright" example on the right—downstream of a filter/separator: one of the most important components of a turbofuel handling system.

In such a system fuel normally passes through filter/separators at least three times.

And how does a filter/separator work?
It usually employs two stages as shown in the diagram. The elements of the first stage have the dual function of filtering solid contaminants and coalescing finely dispersed water. The second stage serves to repel or divert free water to the water sump thus preventing any coalesced water droplets which are still being carried by the flow of fuel from passing into the outlet pipe.



This is just one way in which Esso ensures safe service—always vital but never more so than at a trans-Atlantic airport handling both civil and military long-haul traffic.

What is the traffic picture today?
Prestwick is busy and getting busier. Back in 1947 some 81,000 passengers used the airport. By 1959 the figure stood at 243,658 and last year it increased to 301,257. Apart from military transport operations five of the World's principal airlines route trans-Atlantic services through Prestwick, to say nothing of seasonal short-haul operations and the fact that the airport also handles flight tests of military aircraft overhauled by Scottish Aviation Limited.

And what are Prestwick's future plans?
The recent extension of the main runway to 9,800 feet is only the first stage of the Ministry of Aviation, Scottish Division's, airport redevelopment scheme to make Prestwick fully capable of handling future jet traffic. A new control tower and fire station are being built and a new terminal building and apron is planned with a hydrant refuelling system which will incorporate much in the way of Esso's latest design-thinking. Prestwick is planning for the future in a big way and Esso is proud to be of service—swift efficient service for today and tomorrow with safety as a primary concern.

Esso Petroleum Company Limited,
Aviation Department,
36 Queen Anne's Gate, London S.W.1
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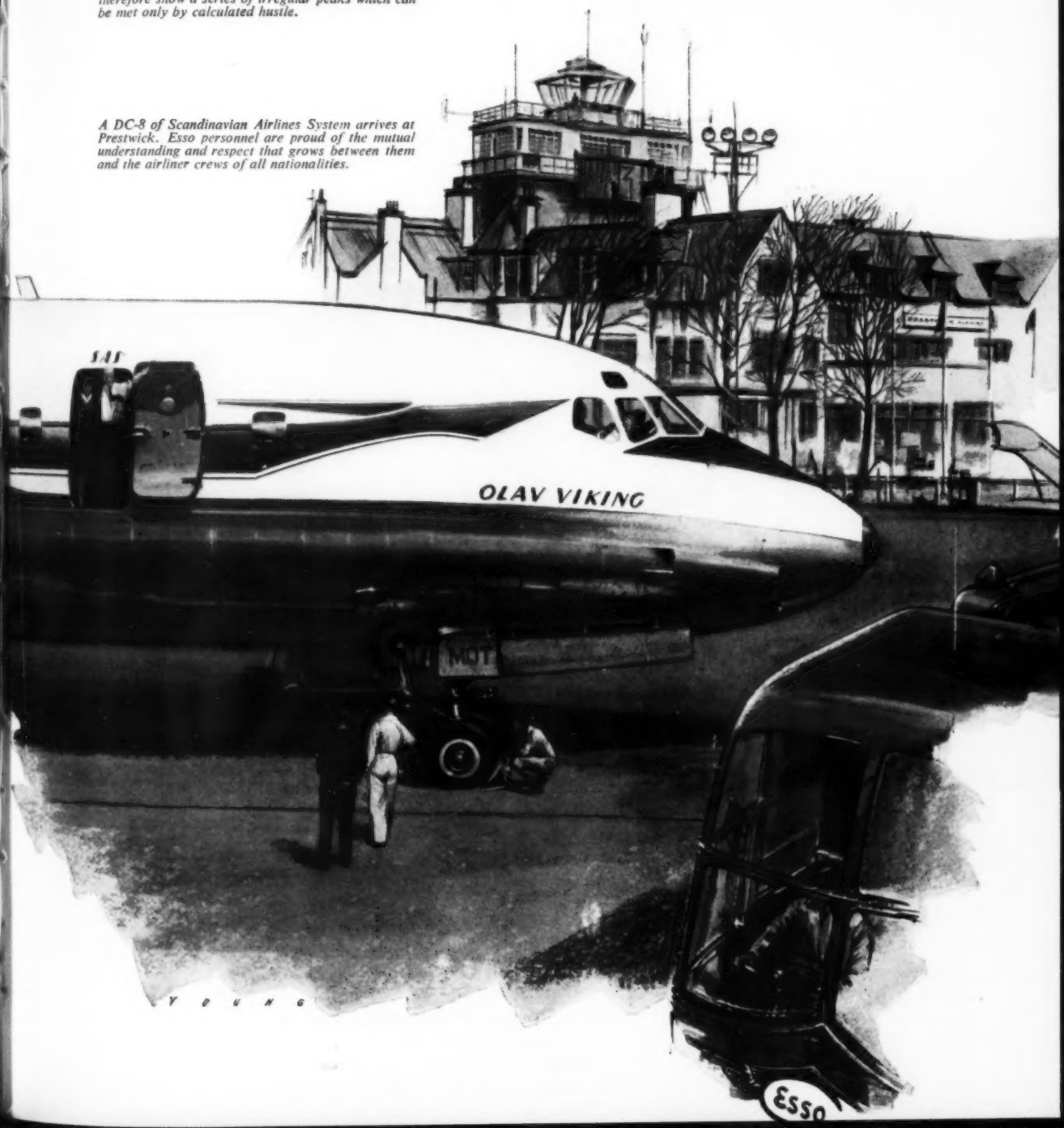
Military movements can hardly be scheduled. Plotted on a graph, the fuel demands at Prestwick would therefore show a series of irregular peaks which can be met only by calculated hustle.

A DC-8 of Scandinavian Airlines System arrives at Prestwick. Esso personnel are proud of the mutual understanding and respect that grows between them and the airliner crews of all nationalities.



FRANCE: SA Caravelle Breguet 1150 Atlantic Transall C160 Mirage 3
SWEDEN: SAAB Lansen SAAB Draken ITALY: Fiat G91T JAPAN: Namco YS11
HOLLAND: Fokker Friendship USA: Boeing 707 USSR: Rover APU

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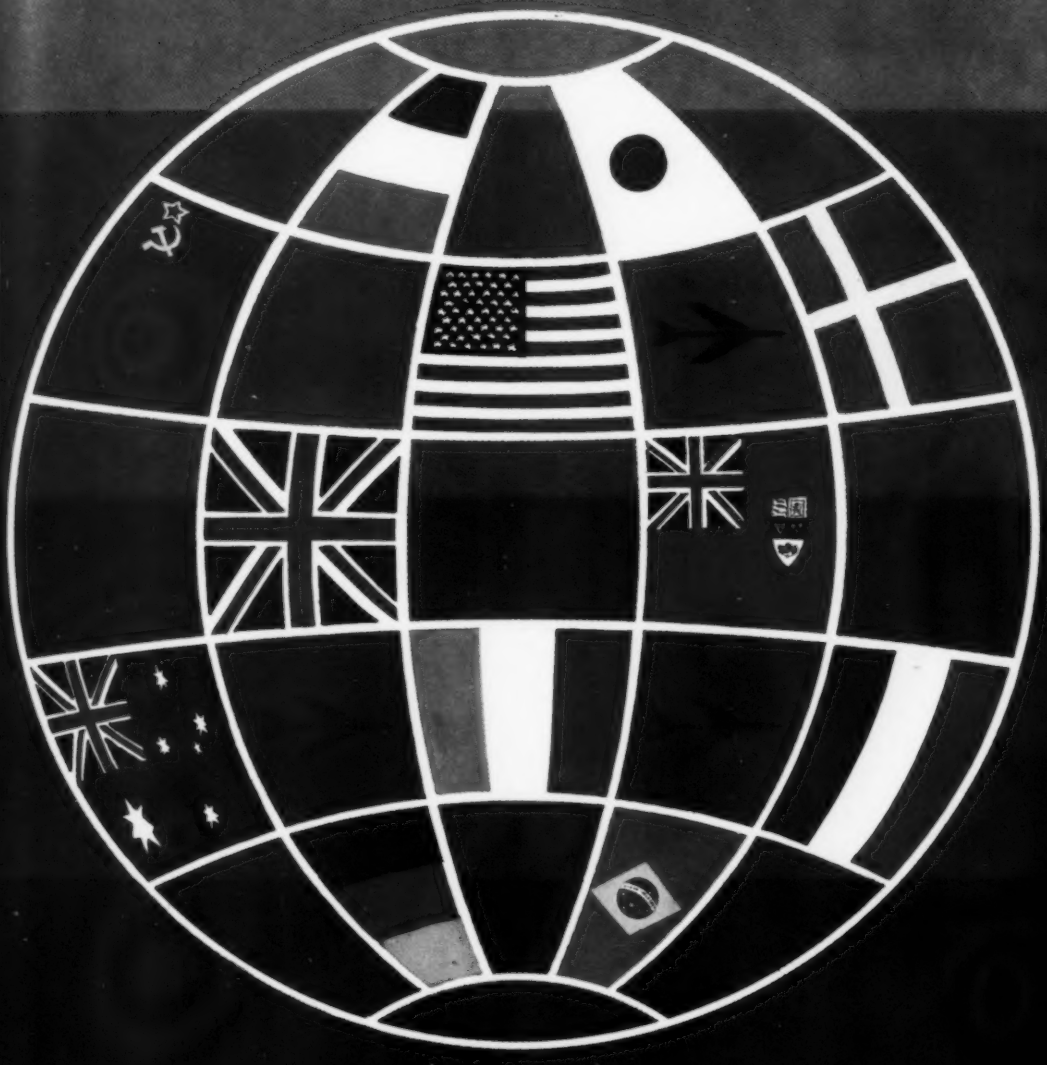

FRANCE: SA Caravelle Breguet 1150 Atlantic Transall C160
SWEDEN: SAAB Lansen SAAB Draken ITALY: Fiat G91T Macchi MB326
GERMANY: BMW engine type 6002 Dornier Do27 & Do28 JAPAN: Namco YS11
HOLLAND: Fokker Friendship USA: Grumman Gulfstream USSR: Rover APU

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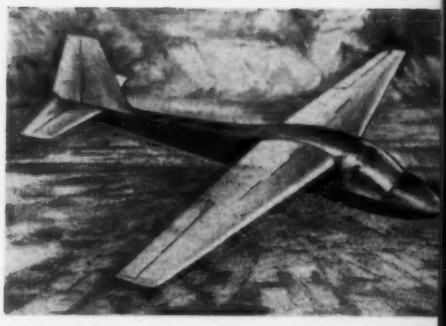
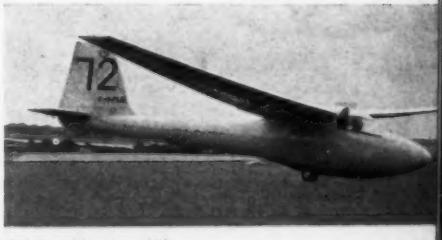
Sailplanes

Slingsby Swallow



Slingsby T.49

Slingsby Skylark 3f



Elliotts Olympia 419

ELLIOTTS OF NEWBURY LTD

Albert Works, Newbury, Berks. Telephone: Newbury 3361

Type 460 Following flight experience with the first three examples of this fifteen-metre sailplane, a fourth machine is now being built which should represent the definitive production version. Employing the same wing as its predecessors, the new aircraft will have a revised fuselage in which the line of the canopy is lowered and the pilot has a more reclined position. The wing fuselage junction will be self-sealing.

The empty weight of the 460 is only 350lb. The aircraft should be available for delivery next year, at a price (for a limited quantity only) of £1,000.

Olympia 419 Three of the top five places in this year's National Gliding Championships, including the winning position, went to pilots flying Elliotts 419 19-metre sailplanes. Although production has now ceased, the type is still available at £2,150.

SLINGSBY SAILPLANES LTD

Kirbymoorside, Yorkshire. Telephone: Kirbymoorside 312

Type 49 Newest sailplane in the Slingsby range, this side-by-side two-seater has been designed as a comprehensive training machine suitable both for *ab initio* instruction and advanced tuition in soaring, blind flying and aerobatics. The prototype is nearing completion at Kirbymoorside and should fly within the next few weeks. Backed by 27 years' experience in designing two-seat training gliders, the Slingsby company is confident that the new machine will prove a worthy successor to the ubiquitous T.21b. Sinking-speed and gliding-angle performance of the 17-metre T.49 should be comparable to that of 15-metre single-seaters.

Skylark 4 Successor to the world-beating Skylark 3, the Mk 4 version of Kirbymoorside's high-performance single-seater will have a re-styled, shallower fuselage incorporating an all-moving tail, swept fin, retractable wheel and a slightly reclined position for the pilot. Object of the re-design is to bring the 18-metre Skylark up to date and so make it more attractive in the world market.

Other types Familiar types still in production at Kirbymoorside include the Skylark 3f (basic price £1,400), Skylark 2 (£1,145), T.45 Swallow (£930) and T.42 Eagle (£2,000).

Elliotts Type 460

Avro Blue Steel on transporter, with Vulcan

British Missiles 1961

A. V. ROE & CO LTD (Weapons Research Division)

Woodford, Cheshire. Telephone: Bramhall 1620

Blue Steel Largest British missile at present under development, Blue Steel is essentially a pilotless miniature aeroplane which can be launched from beneath a V-bomber at least 100 miles from a target and left to navigate by itself and deliver its thermonuclear payload with pin-point accuracy. Constructed largely from stainless-steel honeycomb sandwich, the airframe is designed for a cruising speed of about M2, and to perform violent manœuvres at all altitudes. Propulsion is provided by a Bristol Siddeley Stentor rocket engine fed with HTP and kerosine from tankage within the 35ft fuselage, and the Elliott inertial guidance system controls the trajectory by twist-and-steer, the vehicle being rolled by ailerons on the trailing edge of the rear-mounted wing and then being pulled round in the turn by the canard foreplanes. An upper fin and rudder, and a larger folding lower fin, provide directional control. Intensive trials have brought the Mk 1 weapon within a few months of operational service, and eventually each Victor B.2 and Vulcan B.2 will be equipped to carry one missile on the centreline. Blue Steel is currently of uncommon interest to Members of Parliament, who frequently demand an assurance that it will enter service with Bomber Command long enough before the American Skybolt to make its development worthwhile. Such an assurance has always been forthcoming.

BRISTOL AIRCRAFT LTD

Filton, Bristol. Telephone: Bristol 693831

Bloodhound Developed for the Royal Air Force by a team led by Bristol Aircraft and Ferranti, this surface-to-air weapon system has proved outstandingly successful, winning major export orders from nations able to select equipment from any country. Virtually a pilotless intercepter, Bloodhound has a body some 25ft in length, much of which is kerosine tankage for the Bristol Siddeley Thor ramjets mounted above and below. These engines are lit shortly before burnout and separation of the four rocket boost motors, and the missile thereafter homes on to its target by means of a semi-active radar system. The radiation reflected from the enemy aircraft is picked up by the receiver aerial in the nose of the missile, which then produces an error signal which controls the flight of the missile

Bristol/Ferranti Bloodhound Mk 1 Fire Unit at RAF Station Woolfox Lodge

Emergencies demand reliability

42 Commando, Royal Marines, is part of the complement of H.M.S. *Bulwark*—the Royal Navy's first Commando carrier. It is *Bulwark's* task to rush rapidly deployable forces to spots where trouble threatens. The Westland Whirlwind helicopters of this fast-striking Commando are powered by ALVIS Leonides Major engines.

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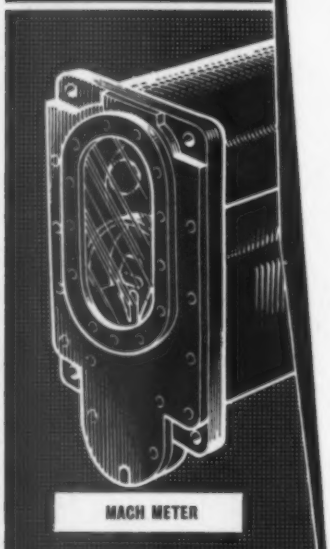
Westland, Hawker Siddeley, Vickers, Gloster, De Havilland, English Electric, Handley Page, A.V.Roe and Armstrong Whitworth

Newmark also manufacture under licence to Lear International S.A. of California, U.S.A., and the Donner Scientific Corp.

STAND 188 FARNBOROUGH



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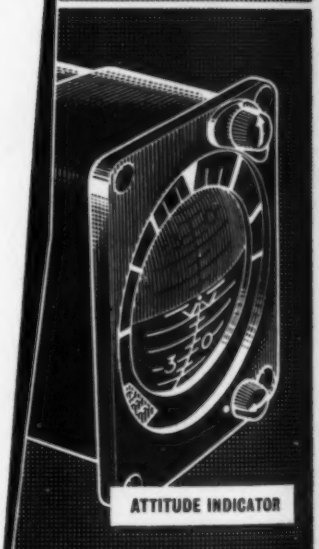

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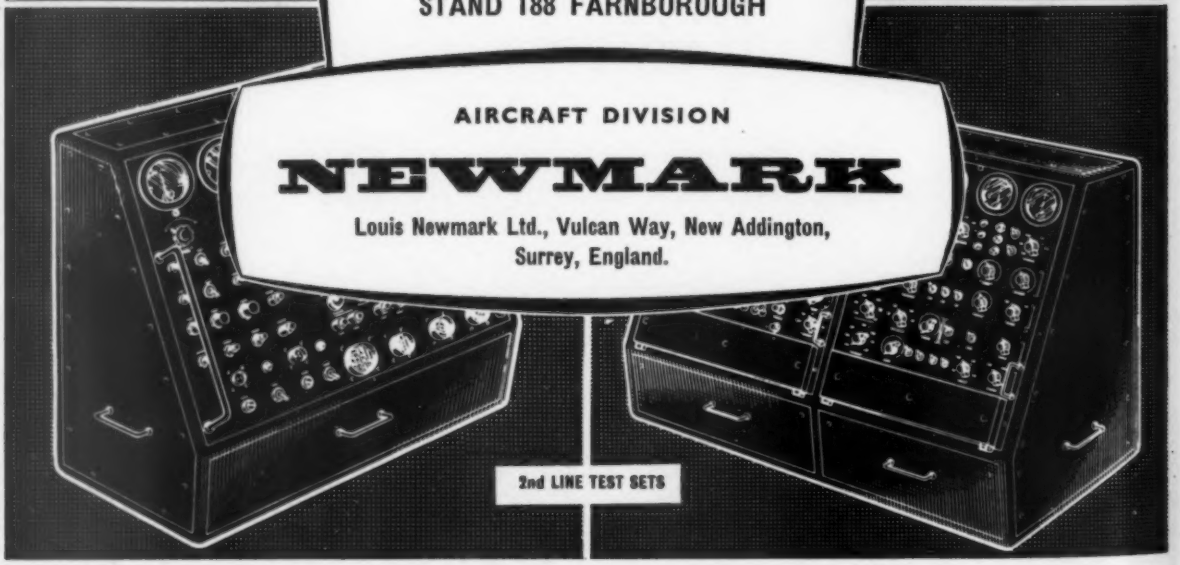


2nd LINE TEST SETS

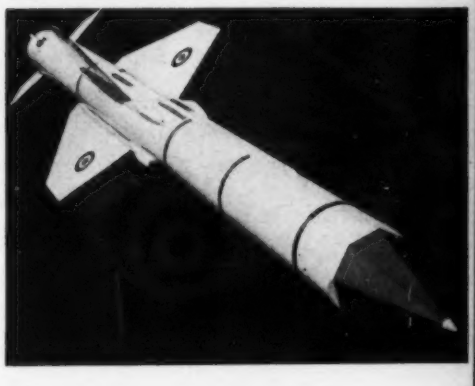
AIRCRAFT DIVISION

NEWMARK

Louis Newmark Ltd., Vulcan Way, New Addington, Surrey, England.

de Havilland Firestreaks in the ready-for-use store at RAF Station Coltishall

de Havilland Red Top



by the moving wings mounted on each side of the body. Bloodhound Mk 1, with pulse-type target-illuminating radar, equips Air Defence Missile Squadrons of Fighter Command, as described in our issues of November 7, 1958, and October 23, 1959. Evaluation orders have been placed by Sweden and Australia. Bloodhound Mk 2 has a continuous-wave radar which makes the weapon effective at greater ranges against targets down to ground level, and increased propulsive power and other changes confer a great increase in performance. Bloodhound 2 is in production for the RAF, and has been adopted as a standard weapon by both Sweden and Switzerland after an evaluation of all available material. The value of these export orders is roughly £35m.

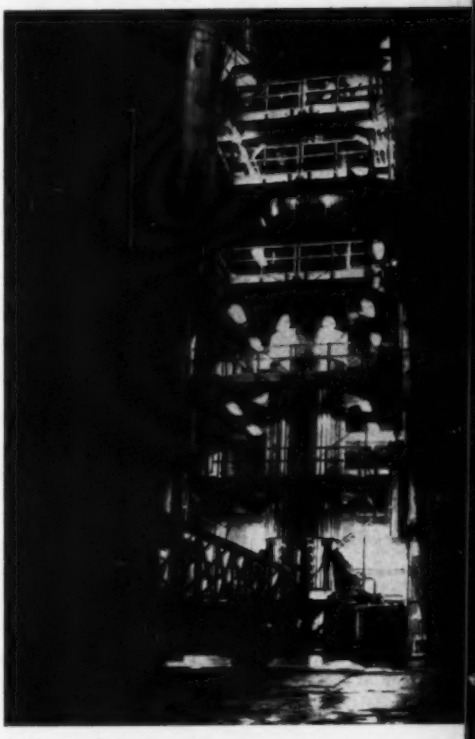
THE DE HAVILLAND AIRCRAFT CO LTD

Hatfield, Hertfordshire. Telephone: Hatfield 2300

Blue Streak Originally planned as a ballistic missile of some 2,500 miles range, this great vehicle has since April 1960 been under development as the first stage of a three-stage satellite-launcher, which it is suggested should be developed jointly by the major European nations together with Australia. Assembled at the D.H. Aircraft factory at Stevenage, Blue Streak has a balloon-type tank bay, fabricated by precision-welding thin stainless-steel sheet, accommodating 60.8 long tons of liquid oxygen and 26.3 tons of kerosine. At the lower end is attached a propulsion bay containing two gimballed Rolls-Royce RZ.2 engines, each with a thrust at sea level of 137,000lb (150,000lb in an uprated version). Liftoff weight of Blue Streak varies between 207,000 and 211,000lb, the complete three-stage satellite launcher weighing approximately 231,000lb. A full description appeared in *Flight* for August 17.

Firestreak This infra-red homing missile is the standard air-to-air weapon of all intercepter squadrons of the RAF and Royal Navy. The Lightning carries two missiles, and the Javelin and Sea Vixen four. Described in *Flight* for March 11, 1960, Firestreak has a stabilized infra-red seeker cell behind the pointed glass nose, which detects the heat radiated behind the target's engines. The missile can be fired on a pursuit course from anywhere behind the enemy aircraft, and D.H. state that radiation from the Sun and cloud background has little effect on the guidance system, and that countermeasures are unlikely to be effective. The rear-mounted control surfaces are actuated by wires coupled to pneumatic rams ahead of the wings; the warhead is at the rear, surrounding the motor tube.

Red Top Unveiled at the Paris Salon in June, this successor to Firestreak is "designed to intercept and destroy the latest types of enemy aircraft over a very wide altitude and speed range." Heat-homing guidance is retained in a developed form, and de Havilland are collaborating with the French Société Matra on both this system and semi-active radar guidance. The larger motor gives Red Top extremely high performance, and the increased span of the wings and tail controls improves manœuvrability at all altitudes. Unlike Firestreak, the new missile follows a collision course to its target from any direction—from dead ahead, if need be. Internal re-arrangement results in the control system being centralized at the rear and the warhead being ahead of the wings.



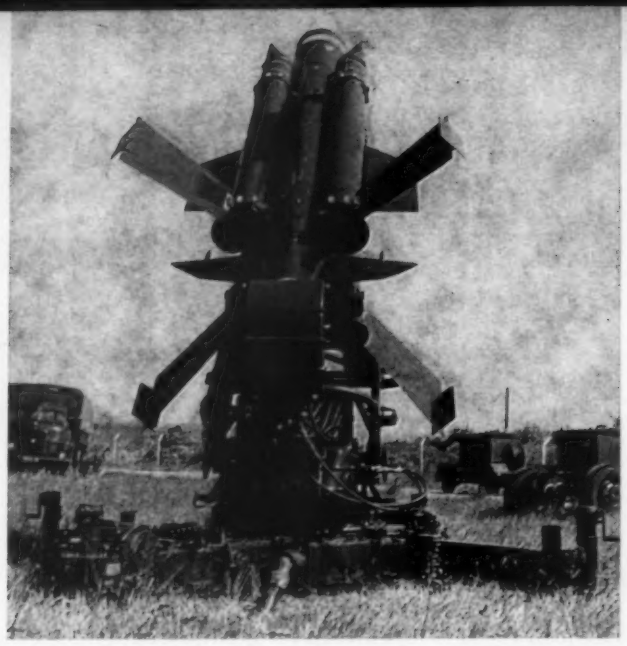
de Havilland Blue Streak in static test tower

ENGLISH ELECTRIC AVIATION LTD (GW Division)

Six Hills Way, Stevenage, Hertfordshire. Telephone: Stevenage 940

Blue Water Britain's first ground-to-ground bombardment missile, Blue Water is under development for the British Army, and also fits a prime NATO requirement better than any other weapon. The missile itself is 25ft long, carries a large conventional or nuclear warhead, has propulsion by a precisely controllable solid motor, and pin-point inertial guidance which controls the trajectory by means of the four 81in-span moving wings. The missile is transported fully assembled on a standard 3-ton truck, which in addition to the missile and launcher also carries complete test facilities and a platform for monitoring and launching. Target computations are performed by an electronic computer carried on a Land Rover. To engage a target, the launcher and Land Rover need be at the launch position for only a few minutes (6min has been publicly demonstrated) and the missile is elevated to the firing position only during the last few seconds. Targets can be engaged at any range up to more than 60 miles, and the fire unit will have moved on to a different location by the time the warhead impacts.

Thunderbird Standard anti-aircraft guided weapon of the British Army, Thunderbird Mk 1 equips regiments of the Royal Artillery. Designed for rapid deployment in completely unprepared locations in any type of terrain, Thunderbird has a solid-propellant motor and semi-active homing radar guidance, as described in *Flight* for September 25, 1959. Thunderbird Mk 2 is a more advanced weapon system, fully air-portable, with new radars and launcher and a missile of greatly increased performance guided by continuous-wave radar effective down to ground level.



English Electric Thunderbird Mk I

English Electric Blue Water

FAIREY ENGINEERING LTD
Heston, Middlesex. Telephone: Hayes 2821

A subsidiary of The Fairey Company, Fairey Engineering are engaged in anti-tank weapon studies, having previously had extensive design and manufacturing experience with the very advanced Orange William system and the Fireflash air-to-air missile. The company is the Australian Government's delegated co-ordinating design authority in the United Kingdom for the Malkara heavy anti-tank missile, and also holds the sales agency for this weapon in all countries except the USA. Malkara is being deployed by the Royal Armoured Corps aboard a new air-portable armoured vehicle, built by Wharton Engineering, which will be seen at Farnborough for the first time. Fairey Engineering also hold European sales rights for the Australian Jindivik target, and is responsible under contract to the Ministry of Aviation for importing, modifying, converting, assembling and introducing Jindivik into service in the UK. The British fleet of Jindivik Mk 102B aircraft will eventually total 130.

FLIGHT REFUELLING LTD
Tarrant Rushton Airfield, Blandford, Dorset. Telephone: Blandford 501

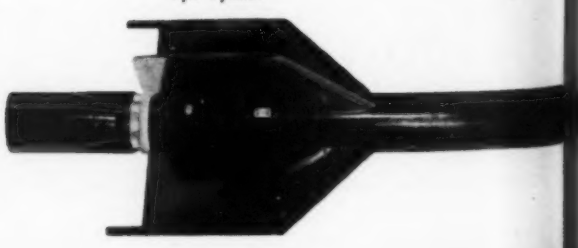
For the first time, Flight Refuelling are able to exhibit one of their outstanding drone conversions of the Meteor. A Meteor U.16 (the conversion of the F.8) will be displayed at Farnborough, and Perspex panels will enable much of the command and control equipment to be examined. Many FR-converted Meteor U.15s and U.16s are operated by Short Bros & Harland at Llanbedr in conjunction with missile trials from Aberporth.

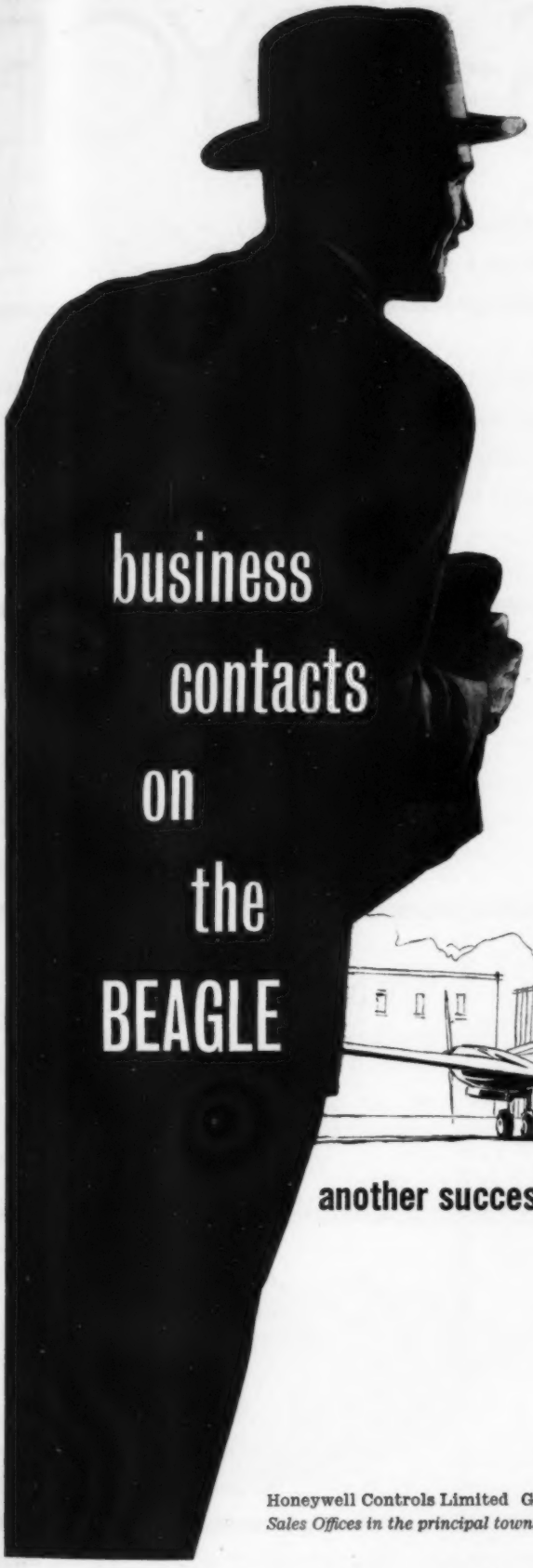
PYE LTD
Royston, Cambs. Telephone: Royston 3072

Python Formerly known merely as the "PV"—emphasizing that it is a private venture, financed by the company—the Python is an 80lb wire-guided missile for use against tanks or other hard-skinned targets. Rate of development has naturally paralleled the rate of expenditure,' but much has been accomplished during the past year. Effort has been concentrated upon a novel method of roll-stabilization. To minimize gyro power only the rear end of the missile, where the cartesian co-ordinates are applied, is prevented from rotating, by using gyro power to oppose the roll inertia of the remainder of the missile. The War Office continue to take a close interest in the programme, and Government ranges have been made available for test firing. Pye have exhibited the Python both as an infantry weapon, and carried on the Land Rover (six rounds) and the Belgian air-droppable AS.243 vehicle (three rounds).

Fairey (Australian Government Aircraft Factories) Malkara Mk I

Pye Python





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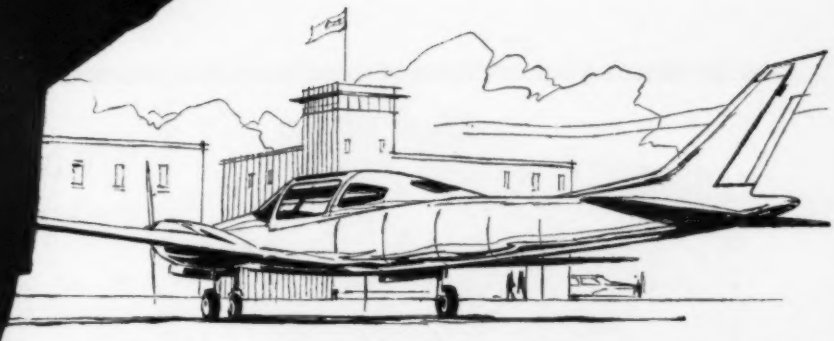

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ROLLS-ROYCE

Since the 1960 S.B.A.C. Display, Rolls-Royce has continued to grow in size and activities, and its Aero Engine Division alone now employs 40,000 people of whom 9,500 are engaged on research and development work. In total the company has over 49,000 employees.

Exports by the company last year rose to the record level of more than £53m., largely through the sale of aero engines and spares. With 27 million hours of experience in civil and military operation Rolls-Royce turbine engines are now in service with or on order for 95 airlines and 32 armed forces around the world.

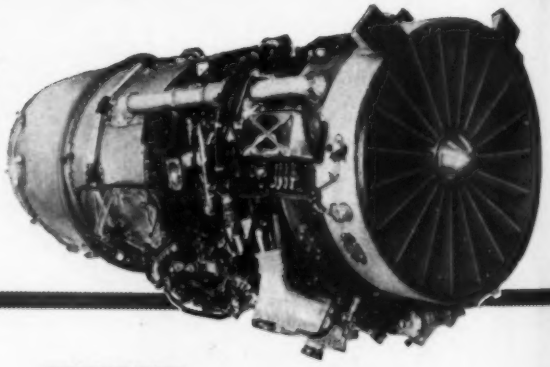
Highlights of progress with Rolls-Royce aero engines in 1961 are given here.

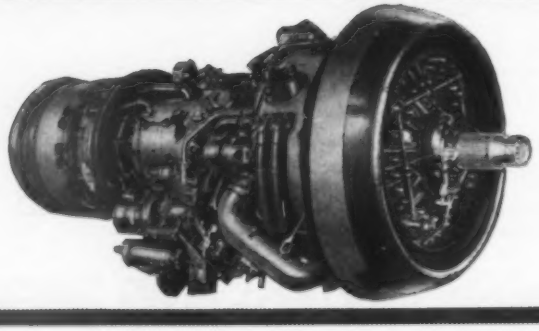
CONWAY

World record overhaul life for by-pass jets — 1,700 hours.

Development running of 20,250 lb. thrust R.Co.42 started.

Increased airline orders for VC.10 and Super VC.10.





TYNE

Introduced into airline service with BEA, TCA, Seaboard World Airlines and the Flying Tiger Line.

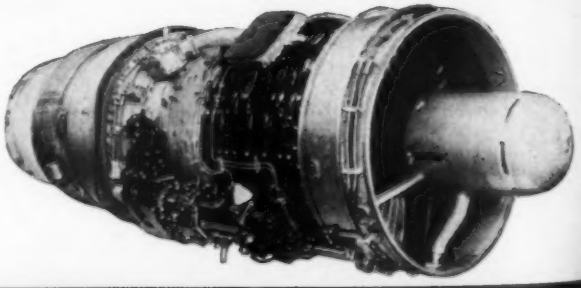
Roll-out of prototype Breguet Atlantic NATO maritime reconnaissance aircraft.

AVON

World record overhaul life for turbo jets — 2,900 hours.

First British turbo jet on domestic services in America in UAL Caravelles.

Latest military version entered service with R.A.F. in Lightning.



ROLLS ROYCE

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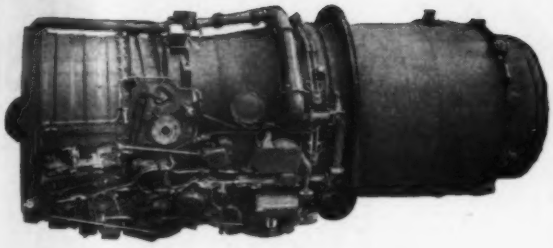


SPEY

Selected to power the new BAC One-Eleven transport.

Government development contract for military version to power Buccaneer S.2.

Ground running trials in the Trident completed.

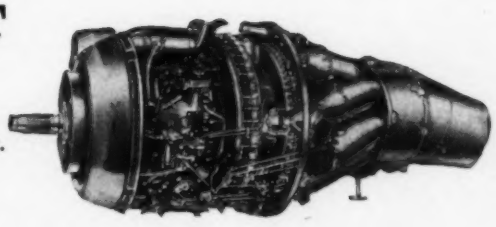
DART

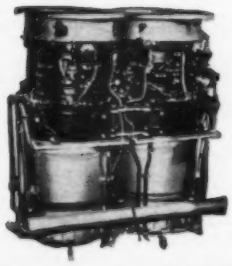
Highest overhaul life ever reached by any aero engine —3,200 hours.

Entered service in Argosy with Riddle Airlines in America.

Entered service in Herald with Jersey Airlines.

Received joint ARB/FAA type certificate at 3,030 e.h.p.





JET LIFT

Development running of RB.145 jet lift engine started.

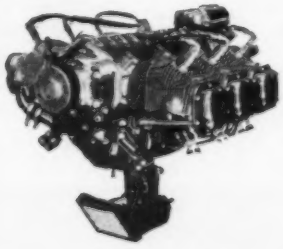
Joint development of RB.162 jet lift engine with France and Germany announced.

Rolls-Royce jet lift engines specified for military VTOL and STOL projects.

LIGHT AIRCRAFT ENGINES

Engines manufactured by Rolls-Royce under licence from Continental Motors scheduled for delivery 1962.

Several new British aircraft to be powered by Rolls-Royce Continentals.



ROCKET MOTORS

Complete Rolls-Royce propulsion system test fired under Blue Streak vehicle at Spadeadam.

Rolls-Royce founder member of British Space Development Company.

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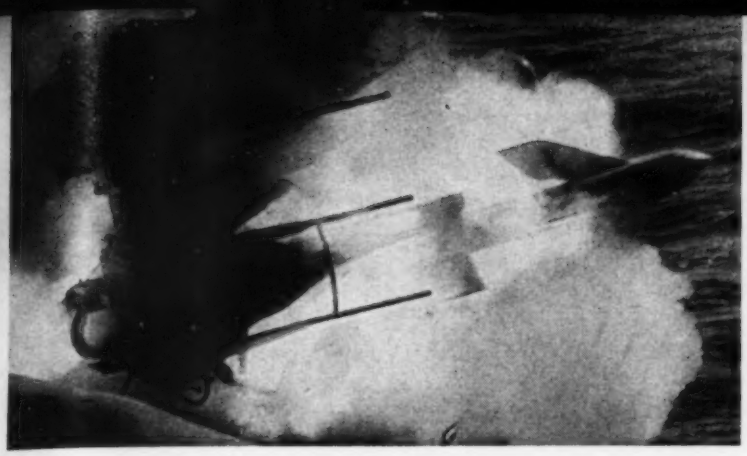


Short Seacat Mk 1 during sea trials

SHORT BROTHERS & HARLAND LTD
Queens Island, Belfast. Telephone: Belfast 58444

Seacat Developed as the standard defence against low-flying aircraft for ships of the Royal Navy down to about 500 tons displacement, Seacat is a simple and highly effective weapon system which can maintain a high rate of fire and be held at instant readiness for long periods. Seacat 1 is only 58in long, and its four swept-back moving wings give it extreme manoeuvrability. It is fired from a quadruple launcher, and both visual radio command and radar guidance may be employed, the Seacat being driven into collision with the target. Seacat 1 has been adopted by the navies of Australia and New Zealand, and evaluation orders have been placed by Sweden and Western Germany. Seacat 2 is an entirely redesigned development, with much increased supersonic performance.

Tigercat Financed by the company, this weapon is a land-based version of Seacat intended to replace conventional artillery. Several types of multiple launcher are being studied to provide heavy firepower against aircraft or land targets.

VICKERS-ARMSTRONGS (AIRCRAFT) LTD
Weybridge, Surrey. Telephone: Weybridge 5555

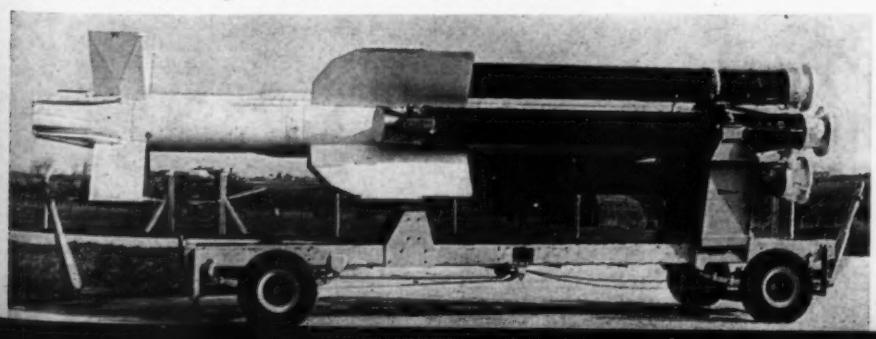
Vigilant During the past five years this company, which is now a member of British Aircraft Corporation, has financed the development of a one-man anti-tank missile of outstanding performance and effectiveness. As described in *Flight* for May 22, 1959, and July 27, 1961, it incorporates an autopilot and has a closed-loop velocity control system which greatly reduces the difficulty of learning to use the missile and achieve high accuracy. Thus, although each round is relatively expensive, the overall cost of training operators, of keeping them proficient and of effecting a kill are relatively low. Weighing 27lb, Vigilant packs a punch which can destroy the heaviest known tank, its launch leaves no flash or smoke, and its deadly accuracy is unrivalled by any other weapon in its class.

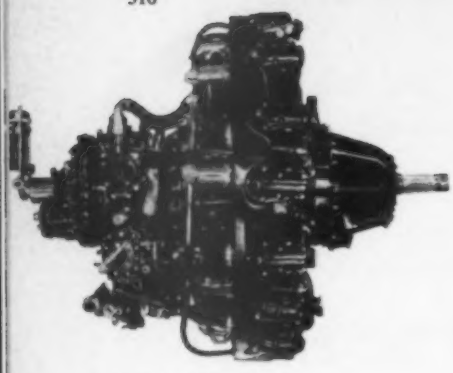
Infantryman setting up Vickers Vigilant

WHITWORTH GLOSTER AIRCRAFT LTD (Armaments Division)
Whitley, Coventry. Telephone: Tollbar 3271

Seaslug Since 1949 a team led by Sir W. G. Armstrong Whitworth Aircraft, with GEC responsible for guidance and Sperry for control, has been developing Seaslug Mk 1 as a standard surface-to-air weapon system for large surface ships of the Royal Navy (the missile is still known as the "Armstrong Whitworth" Seaslug). In order to minimize the volume required to store and handle missiles below decks, the four boost motors are mounted on the forebody, where they require no stabilizing fins, and their noses are squared-off in line with the tip of the missile. The latter has a solid internal motor and is guided by riding up a coded pencil radar beam to the target. Accuracy during trials both ashore and afloat has been so high that a deliberate error is inserted into the guidance system of development rounds to prevent expensive targets from being demolished by impact. The four new County-class destroyers each have a twin launcher on the quarterdeck fed automatically from the magazines and checkout rooms. Seaslug 2 will have greater range and speed, and will be installed in two new destroyers shortly to be ordered. GEC are again the contractor for the guidance receiver.

Armstrong Whitworth Seaslug Mk 1, described under "Whitworth Gloster"





Alvis Leonides 531

British Aero Engines 1961

ALVIS LTD

Holyhead Road, Coventry. Telephone: Coventry 25501

Leonides An attractive and efficient nine-cylinder radial piston engine, the Leonides is in service in more than 40 countries. It is performing arduous duties in military and commercial aeroplanes and helicopters, and most versions have reached a time between overhauls of 1,000hr. Production is continuing on the long-stroke series, which are strengthened to operate at increased powers. The long-stroke Mk 531 weighs 860lb, has a swept volume of 783 cu in, is rated at 650 b.h.p. at 2,000ft and is installed in the Twin Pioneer 3.

Leonides Major A two-row engine with 14 "short-stroke" Leonides cylinders, the Major is widely used in various marks of Westland Whirlwind, to suit the transmission of which the Leonides Major 702 is derated to 750 b.h.p.

BLACKBURN ENGINES LTD

Brough, East Yorkshire. Telephone: Brough 121

Astazou It can now be revealed that Blackburn Engines, a member of Hawker Siddeley Aviation, intend to manufacture this very attractive small turboprop under licence from the Société Turboméca. All current Blackburn turbines stem originally from the designs of this French company, although the engineers at Brough have transformed them during a long programme of development. The Astazou is one of the second-generation engines with an axial compressor stage added upstream of the centrifugal impeller, and it is a single-shaft unit running at constant r.p.m. Although very small and weighing only 271lb, it develops 594 e.h.p. for take-off, and has a cruising rating of 400 e.h.p. at 400 m.p.h. at 20,000ft, with the very attractive specific fuel consumption of 0.49. Moreover, the overhaul life is already 750hr. It remains to be seen what applications Blackburn have in mind.

Nimbus Originally designated A.129, this free-turbine turboshaft unit was evolved from Turboméca-derived engines—the Turmo, in particular—by adding a new two-stage transonic compressor ahead of the centrifugal stage. Weighing 390lb, this efficient, cheap and robust powerplant develops 968 s.h.p. with specific fuel consumption of 0.681; and later versions are described as "in the 1,100 h.p. class." The present Nimbus BN.1 is in production for the Westland Scout helicopter for the British Army, and four of a rather different model will power the Westland SR-N2 hovercraft. A pure-jet version is also available.

Auxiliary units A completely new Blackburn engine is the Cumulus, a turbo-compressor derived from the Turboméca Palouste (flown extensively in the Fairey Ultra-Light helicopter), but more powerful, more compact and lighter than the original French engine. Weighing 210lb, the Cumulus delivers 2.38lb/sec of air at 3.8 pressure ratio, for helicopter tip-drive, or for any airborne or ground auxiliary purpose. The Artouste 510 is another unit widely used in airborne auxiliary powerplants, in particular installed in the Canadair CL-44 and Victor B.2. It can be used to give maximum shaft-power without air bleed, or vice-versa. It can, for example, deliver 1.95lb/sec of air at 3.75 pressure ratio, together with 100 h.p. at the output shaft.

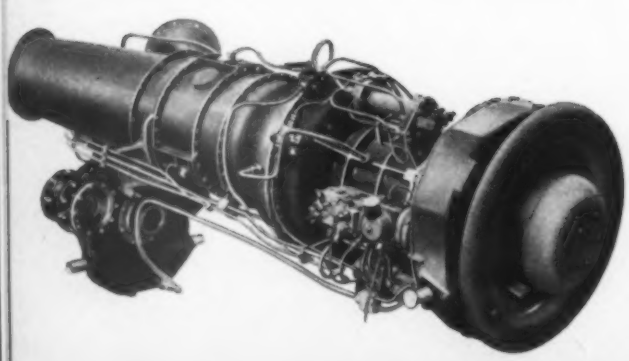
BRISTOL SIDDELEY ENGINES LTD

Mercury House, Knightsbridge, London SW1. Telephone: Kensington 7090

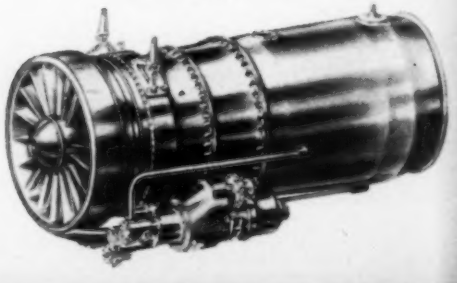
BS.75 Not yet named, this turbofan is sized to fill a gap in existing powerplants, the design thrust being 7,550lb. From the outset it was matched to the BAC-107 twin-engined airliner, and there are other possible applications. After careful study the by-pass ratio was fixed at the high value of 1.72, and the specific consumption in cruising flight is estimated to be no more than about 0.76. Although an entirely new engine, it incorporates an exceptional amount of direct experience with components of existing engines; for example, the three-stage fan is similar to the first three stages of the Olympus 201, the annular vaporizing combustion chamber stems from that of the Sapphire and the complete turbine section is based on the outstandingly experienced turbine of the Proteus. Cooled blades are not used, cast G.64 material having given outstanding service in the Proteus which operates at similar temperatures. The simple design of the B.75 is reflected in the light weight of 1,525lb, and the intake diameter is 33.4in. Financed entirely by the company, the programme is exactly on the schedule planned two years ago. The first complete engine will run next January, prototype flight engines will be available early in 1963 and full production will begin a year later.

BS.100 Not yet referred to officially, the BS.100 has been mentioned in several journals. The following text is taken from the *Sunday Telegraph* for July 30: "Present negotiations are concerned with joint British, American and German finance for . . . a programme for the BS.100, a new lift/thrust engine. The BS.100 will give twice the thrust of the Pegasus."

Blackburn Nimbus



Bristol Siddeley BS.75 (artist's impression



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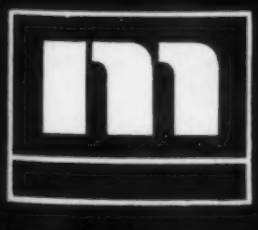

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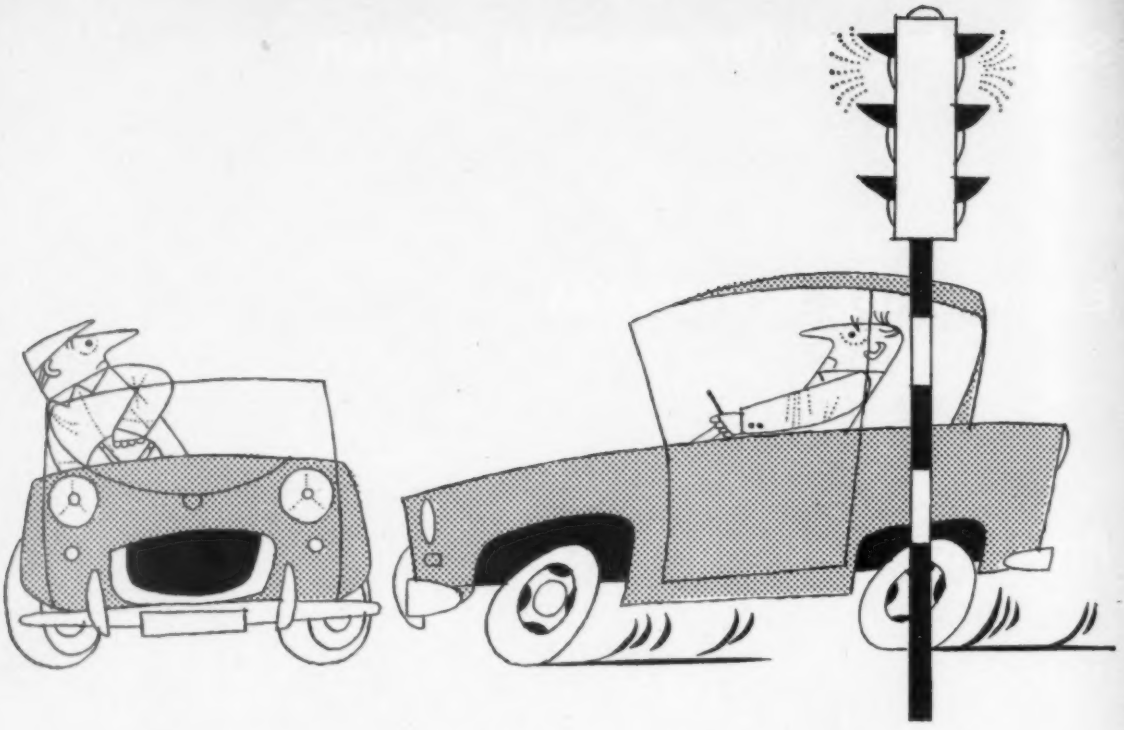

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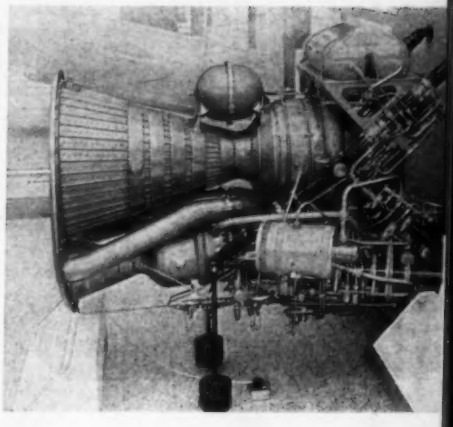
8.J

Bristol Siddeley Pegasus

Olympus This two-shaft turbojet has established an outstanding reputation for economy, superb handling even at great altitudes, long overhaul life and reliability. The first-generation Olympus 104 is rated at 13,500lb thrust, and powers the Avro Vulcan B.1 bomber. The second-generation Olympus 201 is rated at 17,000lb, and is in quantity production and squadron service in the Vulcan B.2. The addition of a zero-stage to the compressor and minor modifications elsewhere leads to the third-generation Olympus 301 with a rating of 20,000lb. Earlier this month a Vulcan 2 started flight trials with four of these very powerful engines, and Bristol Siddeley are themselves about to fly their own Vulcan 2 with two Olympus 301s in Nos 1 and 2 positions. An even more advanced Olympus, with Bristol Siddeley/Solar fully variable reheat, has a thrust of 33,000lb, and engines of this general type are under development for the British Aircraft Corporation TSR.2. Bristol Siddeley have also submitted an Olympus-derived engine to the Ministry of Aviation for use in the British Aircraft Corporation's supersonic airliner.

Orpheus Simple and reliable, the single-shaft Orpheus turbojet is in production in Britain, Germany, Italy and India, and has also been exported to many other countries. Versions include: the Orpheus 701, 4,700lb thrust, for the Gnat fighter; 703, 4,850lb, Hindustan HF-24; 803, 5,000lb, all versions of Fiat G.91; 805, 4,000lb, derated for Japanese Fuji T1-A trainer; and Orpheus 101, 4,250lb, Gnat T.1. An unusual installation supplies propulsion and jet-flap energization in the Hunting H.126.

Bristol Siddeley Stentor



Pegasus Originally designated BS.53, this outstanding engine was the first lift/thrust powerplant in the world and also the first high-ratio turbofan to be developed in Britain (and the first in the world, except for conversions of earlier turbojet designs). The two-stage fan discharges through a forward nozzle on each side, and the hot jet from the remainder of the engine is likewise bifurcated and taken to a rear pair of lateral nozzles. All four nozzles are linked to an irreversible actuator, which points them downwards for lift, forwards for braking, or rearwards for thrust. Financed partly by Bristol Siddeley and partly by the Mutual Weapons Development Programme for NATO requirements, the Pegasus first ran in September 1959 and has been flying in the Hawker P.1127 since last October. The MWDP funding was increased in May, and new versions will probably introduce plenum-chamber burning for supersonic applications. It was unofficially reported recently that at present the Pegasus gives some 13,500lb thrust, and that the next major development will give it 30 per cent more power. Applications include V/STOL transports.

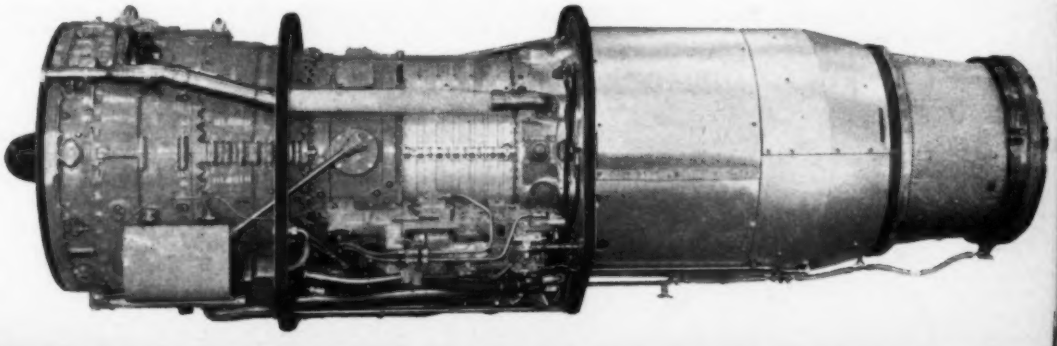
Proteus Also widely employed in marine and industrial applications, this efficient turboprop has flown more than 2,000,000hr in the Britannia airliner and RAF transports. The Proteus 765, rated at 4,400 e.h.p., is clearing to 2,400hr between overhauls, and the 3,900 e.h.p. Proteus 705 is running to 2,800hr.

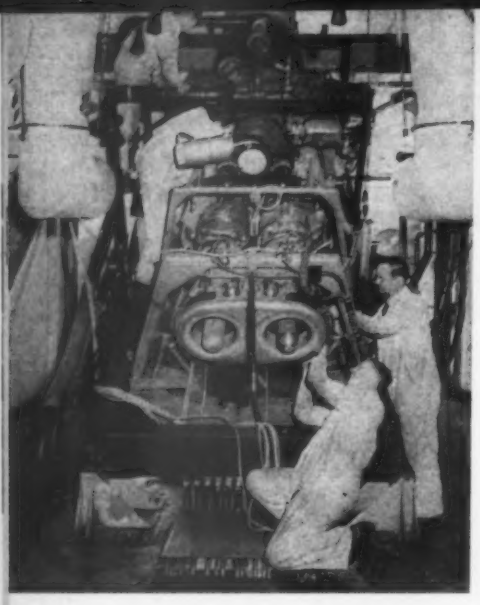
Ramjets Some thousands of Thor engines have been delivered to power the highly supersonic, twin-engined Bloodhound missile. These 16in-diameter powerplants operate on ordinary kerosine, and have demonstrated almost perfect reliability. Brief details have been given of the 18in BSRJ.824, of approximately double the power, and it is known that a more advanced Thor has been developed to power the faster and longer-ranged Bloodhound 2, ordered for the RAF, Sweden and Switzerland. Bristol Siddeley have also conducted extensive research into ramjets for supersonic transports.

Rockets For many years the establishment at Ansty, near Coventry, has been a leading source of HTP/kerosine rocket engines, many of which are fully controllable over a range of thrusts. An enviable record of reliability has been established by the Gamma 201 which powers the Black Knight research vehicle, and the new Gamma 301 incorporates a different chamber design. Powerplant of the Blue Steel stand-off missile for Bomber Command is the Stentor engine, with one large chamber and one small one.

Viper Principal variants of this simple turbojet are the Viper 8, in production for the Jet Provost T.3 and Jindivik 2B and 102B targets, and the Viper 11, with thrust increased from 1,750 to 2,500lb, in production for the Jet Provost T.4, Macchi MB.326 and Jindivik 3A. Later this year bench-testing will begin on the 3,000lb-thrust BSV.20, a company-financed powerplant for the de Havilland D.H.125, Douglas-Piaggio 808 and other applications. The D.H.125 is scheduled to fly next year.

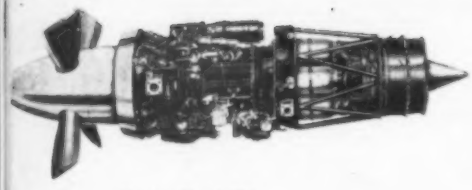
Bristol Siddeley Olympus 21 Mk 301





de Havilland Coupled Gnome H.1200

de Havilland Gyron Junior 101



Napier Eland 504

Napier Gazelle 512

THE DE HAVILLAND ENGINE CO LTD

Leavesden, Hertfordshire. Telephone: Garston 4000.

Gnome The Gnome is essentially identical to the American General Electric T58 turboshaft engine apart from certain external modifications, including British accessories. The de Havilland Engine Co have planned a series of engines for helicopters, distinguished by the prefix "H," and a range of turboprops carrying the letter "P." The first Gnome ran in June 1959, and the basic H.1000, with a one-hour rating of 1,050 s.h.p., is in production to meet large orders placed by the MoA, the governments of Sweden, Australia and Ghana, and the Italian Agusta company. The next development is the H.1200, with a one-hour rating of 1,250 s.h.p., and more powerful units are anticipated. Later this year H.1200 engines will be sent to America for certification in the Vertol 107. Developed for the RAF's new Wessex Mk 2, the Coupled Gnome H.1200 consists of two power sections joined to a single reduction gearbox which not only incorporates freewheels to permit the helicopter to fly with either engine out of action but also provides drives for a wide range of accessories. Each half of this unit has a 2½min contingency rating of 1,350 s.h.p. The turboprop Gnome P.1000 is matched with a new de Havilland three-blade propeller, and passed its special-category flight approval test last year.

Gyron Junior This lightweight single-shaft turbojet exists in two distinct forms, matched to the requirements of very different aircraft. For the Blackburn Buccaneer S.1 the Mk 101 engine is rated at 7,100lb thrust and provides very large quantities of air, bled from a manifold around the combustion chamber, to energize the boundary-layer control and de-icing systems. Compared with earlier Juniors the Mk 101 introduced a zero-stage and variable stator blading. The Gyron Junior DGJ.10 and DGJ.20 series are designed for flight at over M2.5, and are about to fly in the Bristol 188 research aircraft. Like the 188, the supersonic engines are constructed largely from steel or titanium alloys and a fully variable afterburner is provided giving a maximum static rating of 14,000lb.

Other Engines In addition to the service support of many thousands of Gipsy piston engines, Goblin and Ghost turbojets and Super Sprite rocket packages for the Valiant, de Havilland have produced the Spectre 4 for the booster package of the Victor, the Double Spectre rocket engine for the Blue Steel test vehicles and are now able to reveal the Spartan 1, a pre-packed liquid rocket motor suitable for a range of missile or aircraft applications. The Spartan is based on designs by the US Thiokol Chemical Corp, and combines high performance with extreme simplicity and instant readiness. Also in production for missile applications is an HTP-fuelled auxiliary power unit which delivers 36 h.p. at all altitudes; other APUs with the same turbine wheel develop up to 200 h.p.

NAPIER AERO ENGINES LTD

Acton, London W3. Telephone: Shepherds Bush 1220

Eland Both the powerplants at present in production by Napier Aero Engines won export orders within a few days of the announcement of the formation of the company, which is a joint venture by English Electric and Rolls-Royce embracing all the aircraft-propulsion activities formerly undertaken by D. Napier & Son Ltd. The Eland order came from the Puerto Rican airline Caribair, who announced their intention of re-equipping entirely with Canadair/Convair 540s. Similar aircraft are in intensive daily use by Allegheny Airlines and Quebecair, and military CC-109 versions equip No 412 Sqn of the RCAF Air Transport Command. The current Eland 504 is rated at 3,500 e.h.p. and has an overhaul life of 800hr; the E.248 version is at present undergoing clearance at 3,750 e.h.p.

Gazelle Most important of the new company's engines, this free-turbine unit was designed specifically for helicopter propulsion, and it can be installed in any attitude and have any of a variety of exhaust arrangements and final drives. It comprises seven major assemblies, including a compressor with 11 stages of aluminium-bronze blading, six combustion chambers, and a single-stage power turbine driving through an epicyclic gear train (7:1 usually) and torquemeter. Fully Type Approved for military or civil operation, the Gazelle has been subjected to very arduous testing in many parts of the world and is at present cleared to run 250hr between overhauls (400hr is expected before the end of the year). The original MoS requirement was for 1,260 s.h.p., but the Gazelle 161 is in service with the Royal Navy Wessex at 1,450 h.p. and the Gazelle 101 powers the RAF Transport Command Belvedere at 1,465 h.p., with a special contingency rating of 1,650 h.p. Future marks of both helicopters are scheduled to have the Series 2 versions of their present engines, rated at 1,330 h.p. continuously, at 1,540-1,575 h.p. for intermediate contingency and with a special engine-out rating of 1,750 h.p. for the Belvedere. A commercial offshoot is the Gazelle 512, installationally matched to the requirements of transport helicopters. The next development, for which negotiations are now in progress with the MoA, is the uprated NGa.9 for a new mark of Wessex for the Royal Navy; this engine will be rated at 1,750 (intermediate) and 2,000 (full contingency) h.p., and will be installationally interchangeable with present Wessex engines.

The export order for the Gazelle hinted at in the opening sentence of the Eland paragraph was placed by the Australian Government in June, the month in which the company was formed. It provides engines of either Mk 161 or NGa.9 type to power 27 Wessex Mk 31 helicopters for the Royal Australian Navy; the contract is worth some £1,200,000 to Napier. The most advanced version of the Gazelle at present under active development is the NGa.20, with continuous, intermediate and maximum ratings of 2,210, 2,460 and 2,970 h.p.; this engine will have a zero-stage on the compressor.

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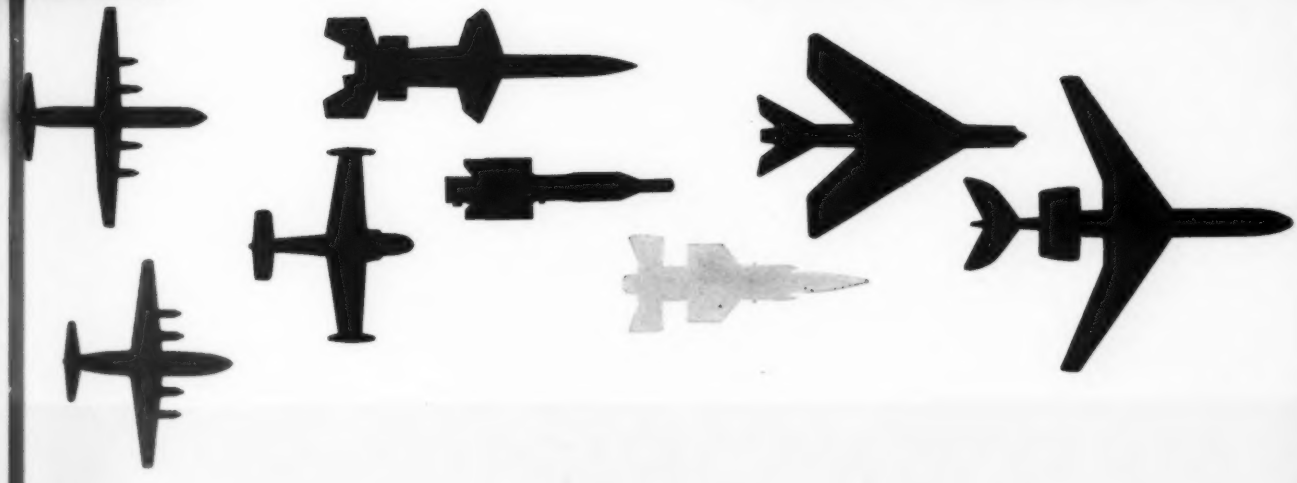
BRITISH AIRCRAFT CORPORATION



VISCOUNT	SUPERSONIC AIRLINER PROJECT	JET PROVOST
VANGUARD	T-188	BLOODHOUND
VC 10—SUPER VC 10	CANBERRA	THUNDERBIRD
BAC ONE-ELEVEN	LIGHTNING	VIGILANT
BAC 107	TSR-2	BLUE WATER

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The new surface-to-surface missile

being developed for the British Army

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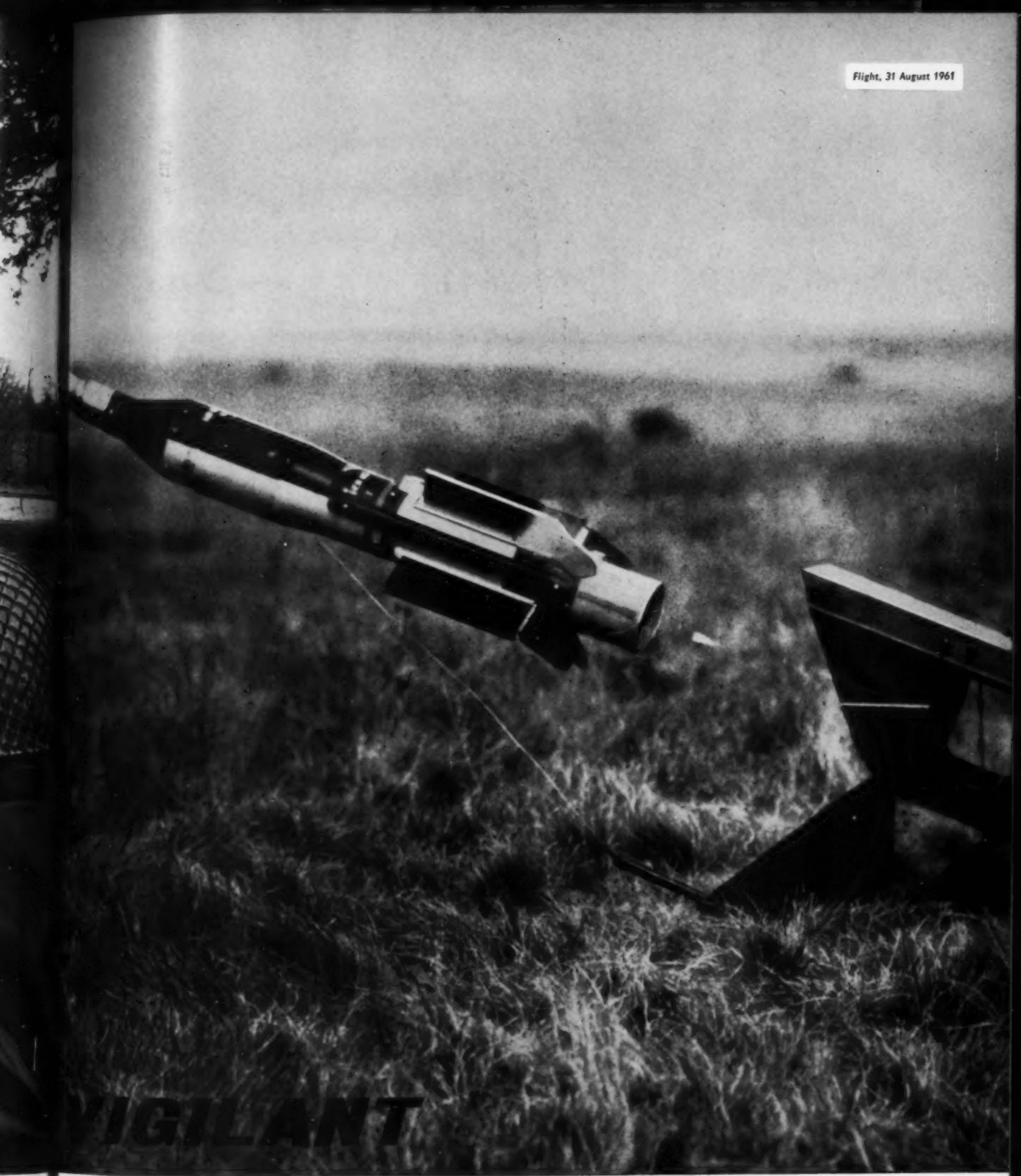

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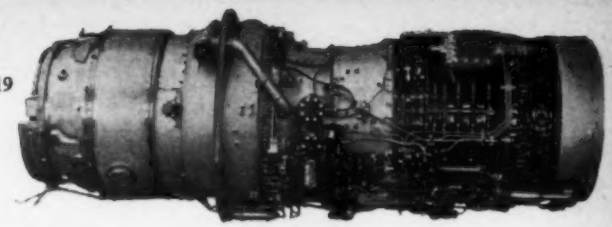
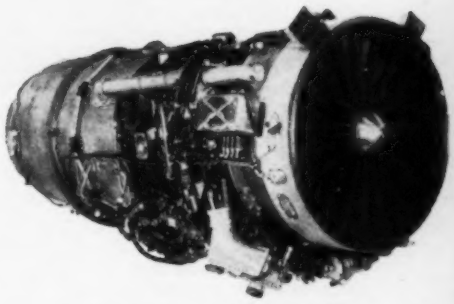


Rolls-Royce Avon 532R

ROLLS-ROYCE LTD

PO Box 31, Derby. Telephone: Derby 42424

Avon Many thousands of Avon turbojets are in service with air forces and airlines all over the world. Their total flight-time is more than 5,000,000hr, of which about 1,500,000hr is accounted for by the commercial airline engines. The earliest of the latter are those fitted to the various types of Comet, and the Mk 524 engines with BOAC at 10,250lb thrust are at present cleared to fly 2,900hr between overhauls, with trials to 3,200hr. For the Caravelle a succession of improvements has led to the Mk 532R engine now in service with United Air Lines; the 532R has an additional compressor stage and runs at increased temperature to give a guaranteed minimum thrust (with reverser and suppressor) of 12,600lb. The latest military Avons are fitted to the Lightning and the Swedish Draken, rated at 14,400 to 16,600lb.



Rolls-Royce Conway 509

Conway Also fitted to the Victor B.2 bomber, the Conway by-pass engine is in widespread airline service in the Boeing 707-420 and DC-8-40. Hours in scheduled service are in excess of 500,000; time between overhauls has risen to 1,600hr, with trials to 1,800hr, and most operators should have reached 2,000hr by the end of the year. Guaranteed minimum rating is 17,500lb, and a slightly modified engine rated at 18,500lb is available. For the VC10 the RCo.42/1 and 42/3 are being developed, respectively rated at 20,250lb and 21,800lb guaranteed minimum thrust. These have a redesigned low-pressure compressor and a rebladed turbine, to give double the by-pass ratio (0.6 instead of 0.3) and considerably greater power without major modification to the critical high-pressure and high-temperature portions.

Dart Known to air travellers everywhere, this single-shaft turboprop is possibly the world's most reliable aeroplane engine, and certainly has the longest authorized time between overhauls. The RDa.3, rated at 1,540 e.h.p., has reached 3,200hr, between overhauls; the RDa.6, rated at 1,740 e.h.p., has reached 3,100hr, and even the 2,100 e.h.p. RDa.7 has now also reached the magic 3,000hr figure. Total time logged by all Darts is approximately 20,000,000hr, the vast majority in Viscounts. More powerful versions are now coming into production, the Argosy C.1 of the RAF having the 2,680 e.h.p. RDa.8 and the Japanese Namco YS-11 having the fully certificated RDa.10/1, with a guaranteed power of 3,030 e.h.p.

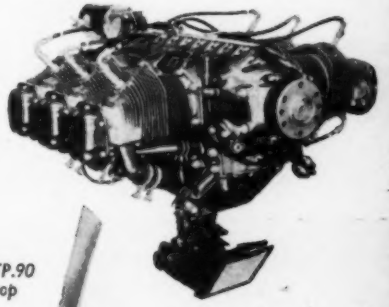
Assembly of Rolls-Royce Spey

RB.145 This is one of a variety of small military turbojets capable of giving both lift and thrust according to installation. The basic dry rating is 2,750lb. Later developments are the subject of contracts from Western Germany, and unofficial reports have mentioned the RB.153, said to have a rating of 4,900lb.

Spey This new turbofan (or "by-pass turbojet") is the most efficient engine that can today be designed for aircraft cruising at speeds close to that of sound. The pressure ratio is higher than in any other aero engine, the by-pass ratio is optimized near to unity, and the flame temperature is relatively high in order to achieve peak efficiency, air-cooled turbine rotor blading being employed to retain the excellent blade life established on older and cooler engines. The fuel system, made by Lucas to Rolls-Royce design, is much simpler and more robust than previous systems. Commercial Speys, for the Trident, BAC-111 and Sud Caravelle Junior, are rated at 9,850lb guaranteed, and in cruising flight achieve the outstanding specific consumption of about 0·787. More powerful versions are under development, and the first military application is for the RSp.1 powerplant for the Buccaneer S.2.

Tyne The most advanced turboprop in the world, this two-shaft engine is exceptionally powerful and efficient. Although scarcely larger than the Dart, it is already giving guaranteed powers between 4,785 and 5,500 e.h.p., and is settling down in scheduled service with the Vanguard and CL-44. More powerful engines will be fitted to the Belfast, Atlantic and Transall freighter, and RTy.20 engines are already running at around 7,000 e.h.p. for the latter aircraft.

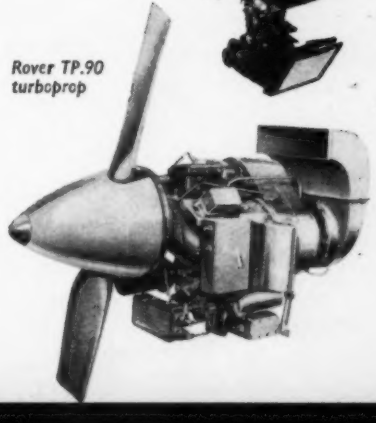
Rolls-Royce Continental O300C



Continental piston engines The Rolls-Royce Light Aircraft Engine Department (part of the Motor Car Division at Crewe) has been charged with the task of producing the engines of Continental design for which Rolls-Royce have obtained a licence. Principal types are the 100 h.p. O200A, the 145 h.p. O300A and the IO470 (260 h.p.) and GIO470 (310 h.p.)

VTOL Rolls-Royce are world leaders in the development of lightweight turbojets used solely to provide lift for STOL and VTOL aircraft. From the 2,130lb-thrust RB.108 the company have produced a unit with the exceptional thrust/weight ratio of 16:1. This engine is believed to be designated RB.162, which is the subject of a development agreement with France and Germany.

Rover TP.90 turboprop



ROVER GAS TURBINES LTD

Solihull, Warwickshire. Telephone: Sheldon 4242

Following extensive experience with a simple single-shaft gas turbine in industrial, marine and automotive fields, Rover have produced the TP.90 turboprop for single- and multi-engined light aircraft. Twin lateral intakes feed the centrifugal compressor, which delivers to a reverse-flow combustion chamber discharging through a single-stage turbine machined from N.105. Weighing 200lb without propeller, the TP.90 delivers 120 h.p. at 47,000 r.p.m., and was found to be delightfully smooth by a *Flight* pilot who sampled it in the air earlier this year.

NEW from the ACCESSORY INDUSTRY

REVIEWED in the following pages is a variety of components and accessories, mainly but not entirely for airborne duty. The majority are either completely new since last year's SBAC Show or are production versions of prototypes first seen last year. Others are improved models of designs already in service. Certain trends observable in 1960 are even more apparent this year. Apart from the unceasing quest for lightness—now mainly pursued through the agency of ingenious design—the accent is on miniaturization, particularly in the fields of instrumentation and (with the aid of the transistor) electronics; and where components of a particular kind are used in association there is a praiseworthy tendency towards integrating them into standardized or modular systems. In our review, radio, radar and certain associated equipment are dealt with in a section at the end (page 328).

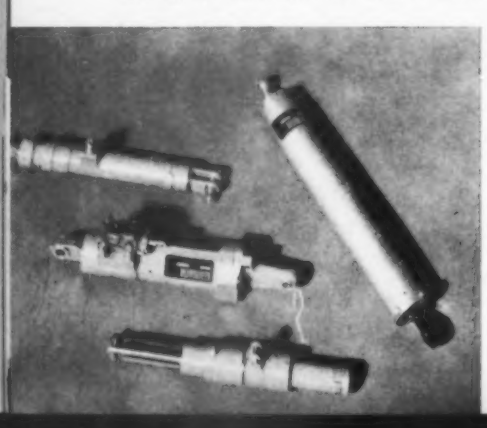
AEI Associated Electrical Industries have developed a range of complete electrical power systems for aircraft, embracing both a.c. and d.c. equipment. During the past year a new range of small toggle switches and hand-operated circuit breakers has been introduced. The former are available for single- to triple-pole applications for a.c. or d.c. ratings up to 20A, and can be supplied with a variety of operating mechanisms so that they can be locked or spring-biased in any position. The new circuit breakers are operated by a push/pull button, and incorporate additional protection features; for example, triple-pole a.c. breakers may be designed to trip following open-circuit on any of the three lines, and all types resist resetting after an overload trip until the mechanism has cooled to ambient temperature. AEI have continued to develop engine electrical equipment, included in which is a fully transistorized high-energy ignition unit.

To meet the requirements of a gas generator for low-pressure engine starting, a steam generating unit has been evolved as a self-contained equipment either enclosed in an air-transportable pod or mounted on a vehicle such as a Land-Rover. The steam is generated in a flash boiler heated by a low-pressure burner operating on wide-cut aviation gasoline. The operating sequence can be completely automatic, with push-button initiation either by the pilot or from the ground; alternatively, the unit may be left running continuously while connected to the aircraft starter ducting. AEI claim many advantages for the use of steam, among them the fact that the output required for a given starter performance is lower than that needed with air, and that operating cost is very low.

Aero Controls Ltd This company has acquired sole sales concessions for Wiggins quick-release self-sealing couplings and the BAR-X all-metal ring seal, and at Farnborough these products will be shown in addition to the company's standard products. The quick-release self-sealing couplings are widely used in America in various applications, such as the umbilical connections for Polaris and Skybolt and the hydraulic and pneumatic systems of several well-known aircraft. They are already being used in comparable applications in this country, including aircraft/missile coolant systems and heat-exchanger circuits in instrument systems.

The BAR-X seals are designed to solve static and dynamic problems in hydraulic, pneumatic and hot-gas systems within a temperature and pressure range of −450°F to 1,200°F and 0—6,000lb/sq in respectively.

Lockheed (Automotive Products) nosewheel retraction jack, flap servodyne and main and nose spring boxes for the Beagle B.206



Airmed Ltd Specialists in oxygen masks, headsets and associated equipment, Airmed have developed a mask harness assembly for use independently of headsets. A toggle mask detachable from a lightweight harness can, it is stated, be positioned in under three seconds without interruption of intercommunication.

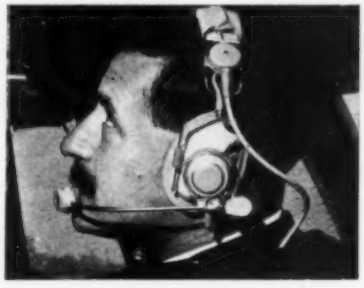
The Airscrew Co & Jicwood Ltd Of the company's products for airborne service, the latest—and to be shown at Farnborough—include a 6.8in axial-flow fan cooling unit of the kind to be used in the Short Belfast; a two-stage 12in axial-flow fan for transmission-oil cooling in the Bristol Belvedere; a 4.5in high-efficiency backward-aerofoil centrifugal fan of the type to be used for windscreen de-misting in the Vickers VC10; a 6.8in radial cooling fan similar to those installed in the Avro 748 and Comet; and a 6¼in diameter C.F.N. fan of the type used to cool the engine-oil system in the Gnome-engined Westland Wessex.

Airtech Ltd Now in worldwide military service, "Aircon" transportable containers for housing radio, navigational and missile control systems have undergone further development during the year. The range now includes two new models, aluminium construction being used in one and a plastic structure in the other. These containers are designed to match the loading parameters of current and projected transport aircraft.

Other new Airtech products include the modulated-light cloud-height recorder (described in *Flight* for August 26, 1960) and a fully transistorized and demultiplexing and data handling equipment for use in air-to-ground telemetry systems.

Amplivox Ltd are now in production with the new Ampilite headset which was shown in prototype form at Farnborough last year. Fully soundproofed, this set weighs less than 15oz and there is a choice of Amplivox microphones—magnetic, noise-cancelling magnetic, or noise-cancelling carbon—mounted on an adjustable boom.

Other new Amplivox products are a headband ear-defender with snap-on fluid-filled acoustic seals, detachable high-impact ear-shells and a replaceable headband cover; a boom microphone headset weighing less than 7oz and designed for use in jet aircraft with low noise-levels; an aircrew hand microphone developed for use in new-generation jet aircraft and specified by BEA for the DH Trident; and an encapsulated amplifier. This last item, weighing 0.5oz and occupying about 0.5 cu in, enables users of radio equipment with only carbon-microphone inputs to use high-speech-quality magnetic microphones; it is powered by the carbon microphone polarizing supply.



Amplivox "Ampilite" headset in production form. It is seen being worn by a Britannia captain of Cunard Eagle Airways

The Anticoustic Co Known for many years as specialists in industrial ear-defenders, Anticoustic have extended their field to include aircraft radio headsets. Their latest product in this field is a lightweight set designed mainly for use in executive and private aircraft. Weight is 10oz, including a noise-cancelling boom microphone and sound-damping earpieces, and it is stated that the set can be worn for long periods in complete comfort (picture: page 321).

Automotive Products Co Ltd Among the products—mainly in the landing-gear and hydraulics field—to be shown on the combined stand of Automotive Products and Lockheed Precision Products at Farnborough will be main and nose gear and flap actuation for the new Beagle B.206. Stated to be the first such equipment specially designed and made in

Britain for an executive aircraft, it will include the new "hydraulic powerpack" —a miniature pump driven by an electric motor and having a self-contained fluid reservoir, accumulator and command switch.

Avdel Ltd In addition to the well-known Chobert riveting system, "Pip" shear pins and "Jo-Bolt" high-strength blind fasteners, the company will be showing at Farnborough the "Huckbolt" high-strength fasteners designed to replace nuts, bolts and solid rivets. Avdel manufacture the placing equipment for this system, in hydro-pneumatic, pneumatic and manual forms.

Avica Equipment Ltd An addition to the Avica piping and ducting system components is the Roylyn range, which is being introduced from the United States. This is a series of medium- and high-pressure self-sealing couplings for ground starter, air conditioning and toilet-servicing couplings, together with filler caps and filter assemblies.

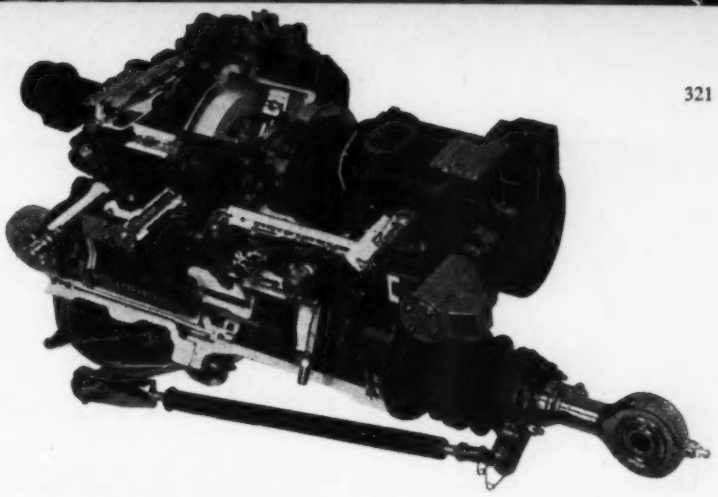
Other new products will be shown at Farnborough by Flexible Ducting Ltd, with whom Avica are associated in the supply of lightweight ductings, special non-metallic fabrications and ground-equipment hoselines.

Belling & Lee Ltd The company's "Camlecon" and "Collecon" connectors, introduced at last year's Farnborough Show, have been further developed. Designed for applications in which high acceleration, vibration and shock forces are likely to be encountered, each socket is individually adjusted to its mating pin, giving a very large increment of contact pressure after engagement. Where climatic effects must be excluded, sealing is incorporated.

Other new components introduced during the year include Belling-Lee "Filtron" interference suppressors, hermetically sealed and suitable for operation in the temperature range −55°C to +125°C; additions to the series of miniature and sub-miniature co-axial connectors; fuselinks for semi-conductor rectifier protection; an improved range of miniature wander-plugs and sockets; a new general-purpose terminal of moderate price; flexible terminal blocks; and a variety of items for printed-circuit applications.

Boulton Paul Aircraft Ltd are now a member of the Dowty Group, and their work falls broadly into three categories: major airframe components; hydraulics, including powered flying control units; and electronic equipment. In the first category some recent major contracts include the following: Canberra and Lightning, the design and incorporation of major modifications; Comet, tailplanes, centre-section floors and associated baffles; Herald, outer wings, ailerons, nacelles, flaps, crew doors and nose-undercarriage doors; Vanguard, flaps and falsework; and Victor, photoflash containers, day and night photographic crates and fuselage tanks.

Boulton Paul are leaders in the development of powered flying control units, and have been the principal contractors responsible for the systems fitted to the Valiant, Vulcan, Buccaneer and VC10. The Buccaneer has tandem-ram units operated by rotary valves and incorporating integral actuators for the acceptance of electrical signals from the autopilot/autostabilizer system. The "package" units fitted to the VC10 are naturally larger, and also incorporate an integral autopilot actuator. The company have recently developed a variable-delivery hydraulic pump incorporating a three-stage hydraulic amplifier, designed for the acceptance of electrical signals which are hydraulically amplified to determine the direction and speed of the final output.



Boulton Paul aileron PFCU designed to accept mechanical and electrical signals

BPA Electronics have produced a number of new equipments. Among these are differential-inductance pick-offs which are immune to temperatures up to 500°C and nuclear radiation, a prototype electronic weighing system (originally designed for use on dynamometers for testing missile high-speed hydraulic motors) and improved versions of the Pendeford Multimeter direct-reading bridge.

S. G. Brown Ltd At Farnborough this year the company will demonstrate the "Gyrotwin", which is the latest version of their Master Dynamic Reference System for aircraft. Its predecessor, the Master Reference Gyro, is in wide-scale service on RN and RAF high-speed aircraft. Also on view will be the Arma Brown gyro compass for helicopters and hovercraft, and a range of headphones, telephones, precision gears and potentiometers and other instruments.

Executive-aircraft headset by the Anticoustic Co

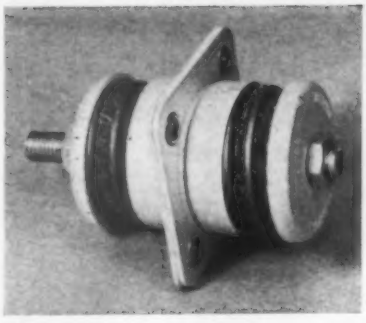
Bryans Aeroquipment Ltd. New among Bryans' very wide range of instrumentation, data-plotting, calibration and test equipment is a tachometer tester consisting of a dual stroboscope with a transistorized tuning fork to provide a stable frequency of 50 c/s for operation of the neostron lamps. A variety of gearboxes and adaptor couplings permits the instrument to be used for calibrating and testing engine tachometers and generators, including helicopter units, dual engine-speed types and synchroscopes.

Delaney Gallay Ltd Best known, perhaps, for its heat-exchange and insulation-blanket products, this company is extending its field by the introduction of new all-metal anti-vibration mountings to protect equipment or to isolate vibration and shock generated by it.

Known as Vibrashock-Isolation, the system consists basically of a resilient cushion of knitted stainless wire compressed to any required density. The individual units are small and of low weight, can accommodate both axial and radial motion, and have an unusually wide load-tolerance for a constant natural frequency; damping can be adjusted to required values. These mountings are stated to be relatively unaffected by temperature extremes, atmospheric pressures, ultra-violet light, and lubricants, water, solvents or dust, and they readily dissipate heat (picture: page 322).

Dowty Nucleonics at Tewkesbury are introducing a new range of toggle switches. These can be of the 1, 2, 3, or 4-pole type, all with heavy-duty contacts carrying up to 20A resistive at 28V d.c., and all can be fitted with a variety of contact arrangements for 2- or 3-way operation, the latter permitting the switch to operate in a selector function. Even the three-pole pattern has a body only 1.3in square by 1.51in deep; any model may have an operating dolly giving three positions (up, centre, down) or any pair of these, and a spring return to the centre may be provided, together with provision for locking at any selected setting. The company emphasize the very firm detent, full spring load being applied until snap action occurs within 1° of a critical point. Synthetic-rubber sealing is provided against water and dust, and internally-illuminated dollies are under development.

In conjunction with Dowty-Rotol, a system has been devised to meet the need of modern aircraft for a highly accurate



"Vibrashock-Isolation" mounting, showing resilient element of stainless-steel wire (Delaney Gallay Ltd.)

NEW from the ACCESSORY INDUSTRY . . .

and reliable nosewheel-steering mechanism for use during taxying and to provide optimum control during take-off or landing. The pilot control is a resistance transducer, which is coupled to a follow-up transducer on the nose undercarriage in the form of a simple Wheatstone-bridge circuit polarized from a d.c. supply. A transistorized amplifier forms a sensing element, operating slave relays in response to error signals. The system is completed by a control panel and any suitable type of steering motor. The system can be adapted to have widely varying characteristics suitable for new or existing aircraft, and provides precise control without backlash or hysteresis.

Dowty-Rotol Ltd The Dowty Group's outstanding technical and material resources have enabled Dowty-Rotol to acquire a leading position in the field of hovercraft lift-fans. In certain circumstances the centrifugal impeller has been found to be superior, and most of the company's work has concentrated upon such designs; but during the last two years considerable effort has been applied to the development of fixed- and variable-pitch axials. Prime requirements for all units are minimum weight and cost, flat head-flow characteristics, high efficiency and long life.

The Dowty-Rotol centrifugal impellers are made of glass-fibre and steel, the blades being attached to a spoked central wheel to give a light and rigid structure. All normal damage has been found easily repairable, and light stainless-steel sheathes minimize erosion and the consequences of stone impact. The results of extensive rig testing and operational employment have indicated the suitability of these fans for use in ground-effect vehicles. Most work has been done on 3ft and 6ft fans, but designs are now under construction absorbing up to 1,300 h.p. in a diameter of up to 12ft.

Another entirely new development is a hydraulic vibration system, which not only gives a clean waveform over a wide range of frequencies but is also considered to be the cheapest possible arrangement for fatigue testing. Cheapness is particularly marked when high thrusts are demanded in the frequency range below 100c/s. An existing model can impart a total force of 50,000lb with a preload of 25,000lb. These vibrators can operate at any predetermined fixed frequency, or they can be controlled by a tape or other variable input.

Dunlop Rubber Co Ltd The company's aviation division has collaborated with the Royal Aircraft Establishment, Bedford, in the latter's design and development of runway arrester-gear. The system—which is to be demonstrated full-scale at Farnborough after the flying displays—is intended to handle aircraft of up to 50,000lb landing at speeds of up to 130kt, and will bring them to rest within 600ft. A reserve of stopping power is available to deal with even higher weights and speeds.

A cable stretched across the runway is attached at each end to a nylon webbing band wound round the horizontally mounted drum of an energy-absorbing installation incorporating a Dunlop multi-disc friction brake. When an alighting aircraft engages the cable, the controlled braking power supplied by the two energy-absorbing installations decelerates the aircraft at a constant and predetermined rate. In permanent installations the mechanical units are partly below ground, but in the case of transportable field units they are mounted on steel frames anchored to the ground.

Brushless a.c. generator for 55kVA variable-frequency system now in production by the English Electric Aircraft Equipment Division

Dunlop are also supplying equipment for runway arrester-gear developed abroad.

In addition to their aircraft tyres, wheels and brakes, the company's exhibits at Farnborough will include a motor-driven brake cooling fan (as used on the DH Trident), thrust-reversal equipment for Rolls-Royce Conway and Spey engines, reheat components, pressure switches and reducing valves, and control units for missile rocket motors, of which the Bristol Siddeley Stentor for Blue Steel is an example.

English Electric Co Ltd During the past year the company's Aircraft Equipment Division has developed a new, compact 30kVA constant-frequency generating system. A single channel consists of only four units: constant-speed drive, brushless generator, combined static control and protection unit, and a contactor. The current transformers of the Merz-Price system are mounted in the generator block and on the bus-bar. The complete channel weighs only 179lb.

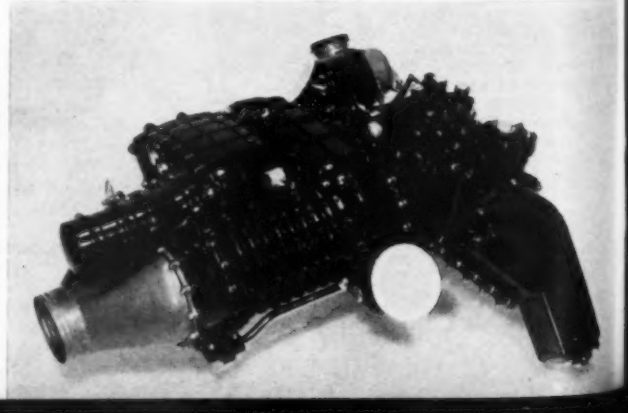
The 38 h.p. drive in this system and the 50 h.p. drive now specified for the Vickers VC10 both benefit in design and construction from experience with the English Electric drive currently in service on BOAC and Air-India Boeing 707s and on the V-bombers.

Also developed during the past year is a 55kVA variable-frequency system. Now in production, it consists of a brushless a.c. generator, a circuit breaker and a control and protection unit embodying semiconductors and printed circuits. An oil-cooled brushless a.c. generator is also being produced in quantity for the Mk 2 Victor constant-frequency system, and a single-phase 400c/s a.c. rotary actuator developed for the VC10 is now being delivered.

Being shown at Farnborough for the first time is the new single-unit constant speed drive, of a type which has already completed 1,600hr in airline service. Of the 15m hours flown by American and British-built Sundstrand constant-speed drives, 180,000hr have been completed by the drives made by English Electric.

The Fairey Company Ltd Some of the most important aviation activities of the Fairey Group of Companies are discussed in the "Missiles and Targets" section on an earlier page. Powered flying controls from the hydraulics division of Fairey Engineering Ltd are being produced for a wide range of aeroplanes, helicopters and VTOL aircraft, and the division claim to have "made more hydraulic power control units than any other company in the world". In addition to systems for such familiar machines as the Trident, Belvedere, Hunter, Fiat G.91, Scimitar, Canberra PR.9 and Gannet, Fairey make power controls for the Rotodyne, Hawker P.1127, Hindustan HF-24 and the new Hunting 126 jet-flap research aircraft. The hydraulics division also produce special microfilters for aircraft, missiles and industrial applications.

Siebe, Gorman & Co Ltd are now part of the Fairey Group. Among their newly developed products are a self-



Godfrey gearbox compressor for Vickers VC10

CUT ALONG DOTTED LINE

THERMIONIC

SIX CHANNEL

RECORDING EQUIPMENT

A rugged and simple to operate Six Channel Magnetic Tape Recorder for use on Airfields, Ports and Harbours, Electricity Grid Control Centres, Police Communications, etc.

The equipment is available in portable or rack mounted installations. An installation to suit individual requirements may be built up from the four basic units:

The tape transport deck, the record unit, the replay unit and bulk erase unit. The recorder may consist of a single tape deck or two tape decks with automatic changeover.

Cross Talk 40 db
Signal to noise ratio 40 db } 35 db.
Distortion: Better than 5%
Mains Supply either: 100/120 volts A.C. 50 cycles, or 200/250 volts A.C. 50 cycles. 60 cycles equipment available to order.

TECHNICAL DATA

Input Impedance: Approx. 30 Kohms allowing for a loading of less than 0·3 db when placed across a 600 ohm line.

Input level: Minus 12 db referred to 1 milliwatt.

Recording Medium: Polyester based "long play" tape ¼" wide.

Recording Tracks: Six on ¼" tape.

Tape Speed: 15/16" per second.

Frequency Response: 300-3,000 cycles per second ±3 db.

THERMIONIC PRODUCTS (ELECTRONICS) LTD

HYTHE, SOUTHAMPTON · *Telephone: HYTHE 3265/7 · Cables: TECHNICO*

AT S.B.A.C FLYING DISPLAY AND EXHIBITION · STAND 290

PLEASE TURN OVER

CUT ALONG DOTTED LINE

THERMIONIC SIX CHANNEL RECORDING EQUIPMENT

GENERAL

The equipment is built up of a number of self contained standard 19" panel mounted units, for mounting either in existing open racking or cabinets, or in a portable case.

Front panels are deeply flanged and provided with transparent covers. In order to maintain portability and to enhance reliability the equipment is fully transistorised. Printed circuitry is used where advantageous. All inter unit connections are via plugs and sockets to MIL, NATO and British Inter Service Specifications.

There are four basic units. Tape transport deck, record unit, replay unit and erase unit.

TAPE TRANSPORT DECK

A precision three motor tape transport incorporates full variable-speed spooling facilities and operates at a normal record or replay speed of $\frac{15}{16}$" per second. Six tracks are recorded in parallel on $\frac{1}{4}$" wide tape.

Interlaced three channel head blocks are used to provide the close spacing required. The heads are mounted on a precision machined mounting plate providing positive alignment under all conditions.

A tape driven, time calibrated tachometer is provided for rapid indexing and tracing of recorded material.

Simple interlocked push-button control provides ease of operation and protection against tape spill or breakage.

The brakes of efficient and simple design are solenoid operated.

Standard 8½" reels of "long play" tape provide eight hours continuous recording time with overlap to cover automatic changeover where more than one tape deck is used.

RECORD UNIT

The unit comprises the main electronic recording facilities. Three printed circuit boards carry each two individual record amplifier circuits containing each: two signal transformers, windings cast in resin, varnish impregnated—four metal film ceramic encapsulated resistors and one transistor of proven reliability (maximum failure rate 0.03% per 1,000 hours).

In addition, using components to similar standards, two further circuits, bias oscillator and voice operated stop/start amplifier are provided. The components are mounted on a glass fibre based copper laminate printed circuit board.

On the front panel, metering facilities are provided as follows:

Bias level, record level and aural headphone monitoring (head current)—all via six position rotary channel selector switch.

An automatic voice operated stop/start is incorporated and an over-ride switch is provided for continuous recording.

Contacts are provided for remote operation of aural and visual alarms. There is a test point for the 18 volt D.C. line.

REPLAY UNIT

A printed circuit board carries two transistorised replay amplifier circuits of similar standards to those in the record unit, using low noise transistors, providing a signal/noise ratio better than 40 db. Full compensation for tape frequency characteristics are incorporated.

The two amplifier circuits are separately switched and provided with individual gain controls. Outputs are provided to loudspeaker, headphones and 600 ohm line. Transcription facilities comprise typist's headset and foot pedal control incorporating run-back.

BULK ERASE UNIT

For security reasons no erase facility is provided on the equipment itself. The bulk erase unit is portable and provided with suitable locks.

TIME INJECTION

A Series III Time Injection Unit may be used with this equipment as an optional extra.

Designed to meet the requirements of the British General Post Office for connection to lines and switchboards.

Fully tropicalised throughout.

Dimensions

UNIT	Width	Height	Depth (Back to Front)	
Tape Deck	19 48·25	12¼ 31·20	7¼ 29·60	ins. cms.
Record	19 48·25	5¼ 13·35	10 25·50	ins. cms.
Replay	19 48·25	5¼ 13·35	10 25·50	ins. cms.
Erase	5 48·25	4 10·20	6½ 16·50	ins. cms.
Time Injection	19 48·25	5¼ 13·35	15 38·00	ins. cms.

THERMIONIC PRODUCTS (ELECTRONICS) LTD

HYTHE, SOUTHAMPTON · Telephone: HYTHE 3265/7 · Cables: TECHNICO

PLEASE TURN OVER

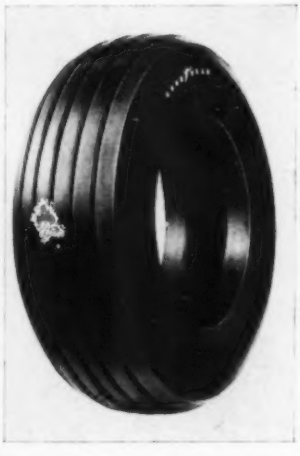
CUT ALONG DOTTED LINE

NEW from the ACCESSORY INDUSTRY . . .

contained air-driven saw for cutting into crashed aircraft, and a new fire-fighting suit of aluminized asbestos with a heat-insulating undersuit, allowing a rescuer to stay "many times longer in the heart of a very high temperature fire than the 50 or so seconds granted by previous suits".

Ferranti Ltd In addition to their already well-known products—which include the Airpass radar fire-control system in its Mk 2 version (though only the Mk 1 system will be on view)—Ferranti will be showing at Farnborough the new Type 100 intermediate-size stable platform for navigation systems. Fully manœuvrable, it carries three accelerometers and is stabilized by three flotation-type gyros. Synchros on the gimbals supply attitude and heading information, and inertial velocity is derived by integrating accelerometer outputs. Driven through geared servo motors, the new platform provides short-term inertial navigation facilities and can be combined with other navigation aids, such as Doppler, in which the high quality of the heading output allows accurate navigation for long periods.

It is likely that the platform on show will be mounted on a rocking table simulating a manœuvring aircraft. As it will be operating in the Schuler tuned

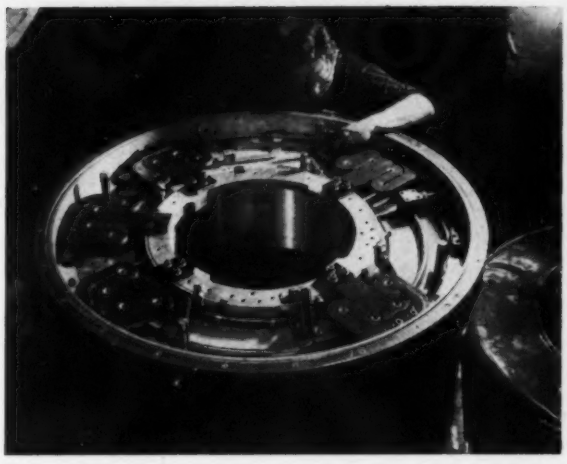


Goodyear Aviation "thermal" tyre

mode, i.e., an undamped period of 84 minutes, it may be possible for the exhibit to demonstrate the velocity of the earth's rotation.

Another recently introduced Ferranti equipment is the Airstream Direction Detector, for presenting angle-of-attack information to a pilot in "head-up" or "head-down" form. Equally effective in the take-off, cruise and approach phases, it enables full advantage to be taken of particular characteristics of the aircraft for particular operations, and it will also warn the pilot when he is approaching an operational limit of his aircraft.

The detector, it is stated, will sense the direction of local airflow to an accuracy of better than 0.1° at speeds over 90kt and may be used to detect sideslip as well as angle of attack. It gives a continuous reading with no flutter or overshoot from 60kt upwards. The system is being fitted as standard equipment to all Scimitar, Sea Vixen and Buccaneer aircraft of the Royal Navy.



Front plate of VG109 Mk III vibration generator, seen during assembly. This is the largest generator in the Goodmans Industries range of vibrators

Firestone Tyre & Rubber Co Ltd In their Farnborough Show display Firestone will be illustrating the special fabric reinforcement which they are now incorporating in the treads of their high-speed tyres. These tyres have been developed to withstand the strains of landings at speeds of the order of 225 m.p.h.

Flight Refuelling Ltd have developed a new fluid-level switch, known as the Mk 15, in which moving parts have been reduced to a minimum. Other new fuel-system equipment by the company includes the 1.75in-diameter Mk 42 in-line refuelling/defuelling valve, with surge relief and a device indicating VALVE OPEN; an air-operated in-line vent valve; a combined jettison and relief valve; and a new range of lightweight pipe-connectors.

General Electric Co Ltd A recent development is a data-transmission system consisting of a ground-to-ground digital data link and an airborne digital-to-analogue converter unit. The ground link utilizes three standard landlines to achieve information rates of up to 3,600 Bauds. After conversion in the airborne unit from digital to analogue form, the instructions to the aircraft can either be displayed on suitable instruments or fed directly to the autopilot. Both ground and airborne equipments are fully transistorized.

Another new system by GEC is a controlled cockpit and instrument lighting installation in which the intensity of illumination can be continuously varied from full brightness to complete extinction by means of a simple circuit using transistors and silicon-controlled rectifiers operating from the 115V, 400c/s aircraft power supply. A feature of the device, it is stated, is the low weight and small physical size of equipment needed to control relatively high power loadings with efficiencies in excess of 90 per cent.

Sir George Godfrey & Partners Ltd A photograph on page 322 illustrates what is probably the largest single unit yet developed by the company for airborne applications: the Godfrey/SRM gearbox compressor Type GB80/210 Mk 1. Four such units provide the charge air for the pressurization and air-conditioning system of the VC10 airliner. Each unit is mounted directly on one of the Conway engines, from which a quill-shaft drive is taken through a speed-increase gearbox to which is dowelled and bolted an SRM screw-type compressor incorporating a slide valve and balance-piston assembly. The effective operating length of the two helically-lobed intermeshing rotors is controlled by the slide valve, which also governs the aperture of the integral intake spill duct. During take-off at sea level the slide valves adopt the minimum-delivery setting, in which three-quarters of the air flow to the compressors is directed through the intake spill ducts. The latter are progressively closed as the aircraft climbs, and shut completely in the maximum-delivery position at cruising r.p.m. at 40,000ft. Manual control of the slide valves can override the automatic system and also permit isolation of any unit. In the event of hydraulic failure, the balance piston—subject to delivery air pressure—moves the valve to the minimum-delivery position. The hydraulic power is obtained from the gearbox oil system.

Goodmans Industries Ltd Specialists in vibration generators, Goodmans will be featuring at Farnborough their recently developed VG109 Mk III generator. This equipment provides peak thrusts of between 18,000lb and 22,000lb over a frequency range of 5 to 2,000c/s.

Goodyear Tyre & Rubber Co (Great Britain) Ltd A recent development by Goodyear is the "thermal" tyre as specified for the Bristol T.188 all-steel research aircraft. The design of this tyre, and the compositions used in the carcase and tread, avoid the need for the refrigeration equipment which would otherwise be necessary in the wheel wells to protect the tyres from the effects of kinetic heating.

Another recent Goodyear development is the "Blue Dot" sidewall inflation system, which eliminates the need for conventional valves and cores, thereby simplifying wheel design.

Lucas hydraulically driven, double-ended fuel boost pump

NEW from the ACCESSORY INDUSTRY . . .

Graviner Manufacturing Co Ltd The company has produced an entirely new development, known as the Triple FD, of its Firewire fire-protection system. High response to flame despite loss of electrical insulation is a feature, and this will be demonstrated at Farnborough by total immersion of a sample in water. The system responds only to temperature rise and will not give a false alarm if accidentally short-circuited.

Also new from Graviner are additions to their range of automatic and hand fire-extinguishers for use in aircraft, in which good extinguishing properties have been combined with low toxicity without increase in weight.

H. M. Hobson Ltd. The de Havilland Trident is fitted with some of the company's most important new developments, which are now in production for this aircraft. The fuel-flow proportioner Type 440 governs the fuel from the two sets of Trident tanks, the proportioning elements being cycloidal rotors driven by the fuel flow of up to 1,000gal/hr; when one tank is empty the Type 440 prevents any air from being pumped to the engines, and an automatic by-pass is provided to pass fuel in the event of rotor seizure. The Trident's three 22.5kVA alternators are driven at a constant 8,000 r.p.m. ±1 per cent over an input speed range of 3,300 to 6,300 r.p.m. by means of the Type 403 hydromechanical constant-speed drive. Type 377 is a rotary hydraulic actuator with two independent hydraulic motors and output shafts with a control valve reset mechanism, specified for the operation of the inboard and outboard flaps, in association with the Type 378 ball-screwjack. The latter incorporates a "no-back" ratchet and friction-tab mechanism which makes the unit irreversible with respect to output loads. Types 392 and 421 are employed respectively on the port and starboard wings to drive the drooping leading edge; both are rotary hydraulic actuators operating through shafting and ball-screwjacks. All Trident hydraulics operate on Skydrol at 3,000lb/sq in. The tank booster pump is the a.c.-driven Type 436, which has a compound axial and centrifugal pumping element delivering 1,000gal/hr at up to 22lb/sq in. Under all operating conditions the unit separates air from the fuel, protects itself against overheating, is fully proof against flame and explosion, can operate in an empty tank and can be changed even when the tank is full.

Hobson also have many developments matched to other modern aircraft, outstanding examples of which are the VC10 and Lightning. Particular mention may be made of the Type 385 feel-simulator unit (surely the most advanced in existence anywhere) for the former aircraft, and the Type 373 Mk 1 cockpit engine control which is obviously fitted to the latter.

"Assisted evacuation" crew seat by M. L. Aviation Co Ltd

Hymatic Engineering Co Ltd In the company's Farnborough exhibit this year emphasis wil be laid on the importance of designing pressure-control systems by integrating the performance of various components rather than by piecemeal assembly of a number of valves in isolation. In pneumatic systems this is particularly important if the necessary stability and adequate control are to be achieved.

Providing part of the pressure control in fuel pressurization systems is the new RV.63 inwards/outwards vent valve, which will be shown for the first time. This provides an additional safeguard by "jacking" the outward relief valve fully open to present minimum restriction should fuel emerge inadvertently during a ground refuelling operation.

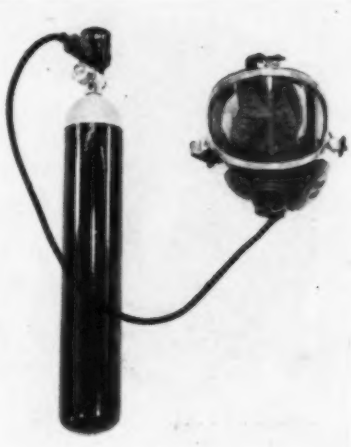
The latest Hymatic personal equipment connectors, providing connection of all personal services to a crew member in a single movement, will also be on display. Other personal equipment on show will be anti-g valves covering the additional function of pressurization in the event of loss of cabin pressure and taking their air supply from the aircraft engine compressor.

The company's knowledge of stability in pressure control systems has led to the development of a range of butterfly valves for operation at high temperatures in many applications, including boundary-layer control and de-icing. The typical 3in valve is light in weight and performs either as a stop valve, giving on/off control, or as a modulating valve, controlling to a set downstream pressure.

The modular system of reducing valves offers more than 5,000 variants which are readily producible from standard elements covering a wide range of predicted performances. The use of standard elements means that prototypes can be produced quickly and inexpensively.

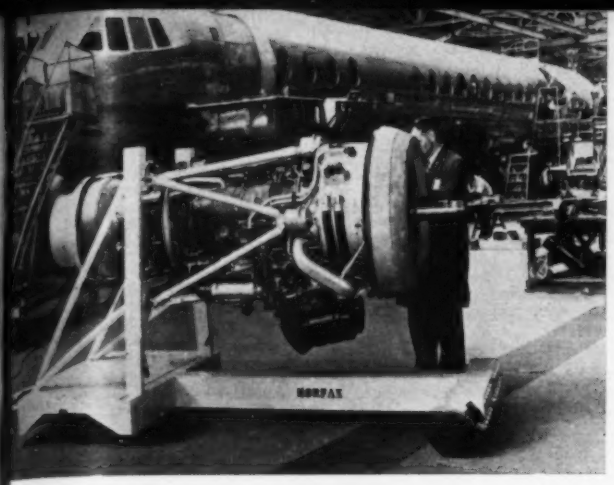
Irving Air Chute of Great Britain Ltd New among the parachute and associated equipment products of Irving is a braking parachute developed for the Lightning. Its construction is designed to facilitate the repair of damage which may be caused by contact with the runway or as a result of jet-efflux heat.

The Walter Kidde Co Ltd A new development by this company is a portable oxygen set with full face-mask, for use by aircrew as an anti-smoke protection in emergency. A 400-litre cylinder with a contents gauge and simple control valve supplies oxygen to a lung-governed demand regulator located on the outer facepiece. This facepiece, which gives extremely wide visibility, is equipped with a microphone, and there is an inner mask to prevent misting of the facepiece by expired air. Total weight of the apparatus is 11lb.



Aircrew emergency anti-smoke breathing set by the Walter Kidde Co Ltd

M. L. Aviation Co Ltd A particularly interesting item developed by M.L. is an "assisted-evacuation crew seat", designed to assist a crew member to leave his seat easily whilst fully equipped and subjected to g forces. Basic features are an inflatable seat-cushion which raises both



Servicing stand for Rolls-Royce Tyne engine, by Morfax Ltd

NEW from the ACCESSORY INDUSTRY . . .

the occupant and the combined parachute pack by inflation from a 1,200lb/sq in air bottle incorporated in the seat; a combined parachute pack containing a G.Q. parachute, a survival pack and an emergency oxygen bottle in a single envelope; and a tapered back-rest to allow increased shoulder room between side-by-side seats in restricted crew spaces. The pack and cushion are retained in the seat, so enabling the crewman to vacate the seat and move about unencumbered.

For emergency use, there are manually operated levers on each side of the seat. An initial upward pull on either lever releases the pack from its stowage clips, collapses the headrest, and releases the lap-strap anchorages. A partial downward movement of the lever then locks the releases in a "safe" condition and a final upward pull inflates the cushion. This inflation pushes both the occupant and his pack out of the seat to a standing position from which he may abandon the aircraft. Two methods of mounting provide for, respectively, (a) roller mounting on floor guide-rails and (b) an adaptor set permitting the seat to be pivot-mounted at the rear and supported at the front by telescopic legs.

Microcell Ltd Being shown at Farnborough for the first time is Microcell's Double Travellite Mk 2 economy-class aircraft seating. In spite of its low weight, state the makers, comfort, flexibility and attractive appearance have not been sacrificed.

A Microcell product of a contrasting nature is the glass-fibre launching pod for air-to-air and air-to-ground 2in rocket armament. A number of detailed improvements have been made in these packs during the year, principally connected with the firing systems and cockpit control and designed to take into account higher operational speeds and altitudes. Four types are now in production—14- and 24-tube launchers retractable into the fuselage, and 24- and 37-tube models for under-wing mounting.

Louis Newmark Ltd Typical of the most recent instrument miniaturization techniques of this company's aircraft division is a rate gyro measuring approximately 2in by 1¼in.

In all the company's new design and development, miniaturization techniques have been followed to keep the weight of equipment to a minimum. Thus, electronic equipment is transistorized throughout and the form of modular construction is used to achieve a high degree of robustness and reliability. Modules are so designed that like functions are interchangeable between the channels of a system, thereby reducing spares holdings.

Lucas Gas Turbine Equipment Ltd A photograph on page 324 illustrates an unusual hydraulically driven double-ended fuel boost pump, which feeds from the tank at sufficient pressure to prevent cavitation under all flight conditions. The hydraulic drive is effected by the fuel itself, which obviates the need for a return connection, all hydraulic flows being exhausted into the main boost line. The unit consists of a main impeller situated in the centre of the tank, fed by auxiliary impellers driven through bevel gears and located in the top and bottom of the tank. The auxiliary impellers feed the main impeller in normal and inverted flight, the central impeller providing most of the pressure rise. At 4,000 r.p.m. the pump can deliver 6,000gal/hr at 30lb/sq in, the weight being 7lb.

An entirely different fuel pump is a new and extremely compact high-pressure gear unit designed to operate primarily on petrols suitable for aircraft gas turbines. These pumps consist of a pair of gears driven from the engine via a quill-shaft, running in plain bearings fully lubricated and sealed against leakage. One of these new units is the GP.200, which weighs only 3.75lb yet at 1,000 r.p.m. delivers 200gal/hr at 1,250lb/sq in, and can operate at 4,500 r.p.m.

Lucas are continuing their research into increasingly perfect combustion systems for both gas turbines and ramjets, and the explosive forming of sheet-metal components is being investigated to improve manufacturing techniques. The forthcoming SBAC exhibition will be the occasion for unveiling two complete fuel systems for aircraft, one being for a turbine helicopter with an electric-computer throttle control (which at once suggests the Gnome), and the other being for a bomber powered by twin-spool turbojets up to an altitude of some 70,000ft (and, since the TSR.2 system is unlikely to be seen this year, this strongly suggests the Vulcan).

Marconi Instruments Ltd Among the electrical instrumentation products of this company are signal generators, oscilloscopes, voltmeters, power meters, Q-meters and impedance bridges. There are over 30 signal generators in the range, and a typical example is the Type 114H, covering the frequency range of 10kc/s 73Mc/s. In order that a high degree of absolute accuracy may be obtained, the instrument has a built-in crystal calibrator with two crystal frequencies, 400kc/s and 2Mc/s, automatically selected by the band-change switch. Amplitude modulation can be applied to the carrier from an internal or external source at any depth up to 80 per cent. Having unusually good frequency-stability (0.002 per cent) and a high-discrimination tuning system, the instrument is particularly suitable for narrow-band response measurements.

Martin-Baker Aircraft Co Ltd Several new features are incorporated in the latest production ejection seats by Martin-Baker as exemplified in the Mk 4MSA seat installed in the Blackburn Buccaneer for the Royal Navy and the Mk H5 for the McDonnell F4H Phantom 2 of the United States Navy.

Capable of ejection from ground level and at airspeeds from 80 knots upwards, the Mk 4MSA is typical of the current production Mk 4 seats. It incorporates the now familiar 80ft/sec three-cartridge telescopic ejection gun, duplex drogue system deployed by the 0.5sec drogue gun, time release mechanism with g-switch, and leg-restraint system. One of the new features is the electrically operated seat-raising mechanism which now replaces the seat-raising handle. The actuator consists of a 28V d.c. motor driving a screwjack attached to the bottom cross-member of the seat structure, operation of the switch on the seat pan raising or lowering the seat as required. The Mk 4MSA is also equipped with inertia shoulder-harness mechanism (which allows the occupant to lean freely forward in the seat but ensures that he is held well back on ejection) and the drogue link line guillotine. The latter, when operated by the manual override lever, explosively severs

Martin-Baker Mk 4MSA ejection seat for the Blackburn Buccaneer

Rotax three-motor linear actuator

NEW from the ACCESSORY INDUSTRY . . .

the drogues from the main parachute and at the same time releases all harness locks. This secondary mechanism is provided for use in the event of the automatics failing as a result of collision or combat damage.

The H5-1 and H5-2 seats for the Phantom 2 are typical of the Mk 5 series ejection seats introduced in 1957 to meet the requirements of the United States Navy. In general, these seats conform to the same basic pattern as the Mk 4, but the structural strength has been increased to withstand crash deceleration loads of up to 40g. A feature of this seat is its quickly detachable seat bucket, incorporated in order to facilitate aircraft servicing without disarming and removal of the ejection seat.

Morfax Ltd Well known in the aircraft industry for their engine assembly and servicing stands and other maintenance equipment, Morfax have extended their engineering work in new directions. One is the production of radar aerial systems, all aspects of the work from initial design to final testing being covered. Projects already completed range from small systems for fighting vehicles to height-finding equipment with parabolic reflectors 35ft long and of 280sq ft surface area.

Other new departures include the development, in collaboration with the MoA, of a method of machining the "difficult" steels by use of CO_2 as a coolant: and the establishment of a very completely equipped test-house, both for their own use and for that of their customers.

Normalair Ltd A recent development by Normalair is a seat-mounted oxygen regulator system. Devised specifically for high-performance aircraft with ejector seats, this system leaves valuable panel space free for other purposes. Every component is mounted on the seat itself, including the regulator, which is supplied with oxygen from the main gaseous or liquid storage. In the event of the pilot having to eject, an emergency cylinder of gaseous oxygen attached to the seat automatically comes into operation until the seat leaves him at a safe, respirable altitude.

Normalair seat-mounted oxygen regulator system

Palmer Aero Products Ltd Two recent developments by Palmer are convoluted p.t.f.e. flexible piping and an automatic process for orbitally welding preformed pipes to end fittings. "Penflex" convoluted piping will be seen at Farnborough in the form of a lightweight low-tension electrical harness. Suitable for conduit work for electrical cable—where an axial collapse property of 20 per cent allows easy access to the backs of plugs for the attachment of cables to pins—Penflex is stated to have unlimited shelf life, to withstand temperatures from −70°C to over 200°C, to resist kinking, and to be dimensionally stable. Bore sizes range from $\frac{1}{4}$in to $\frac{3}{16}$in.

Plannair Ltd A recent introduction by Plannair are blowers to supply air to pilots' pressure suits. They are in course of development under contract for the US Navy and Air Force and will be shown at Farnborough together with other Plannair products, the latter including five different types of air-conditioning blowers for the Vickers VC10. Also on view for the first time at Farnborough will be the "Pres-Loc" quick-release spring-loaded fastener, for securing instrument and other panels. Vibration- and shock-proof, and particularly useful where there is a call for the frequent and easy removal of panels, these fasteners are available with either projecting or flush release buttons.

Precision Forgings Ltd This company will be showing at Farnborough for the first time under this, its new, name. Formerly it was the Blade Division of Garringtons Ltd, a member of the GKN group. Turbine and compressor blades, and a wide variety of precision-forged components in steel and non-ferrous metals, are now being produced in the factory established last year at Cwmbran, Mon. The company has evolved forging methods which allow blades to be produced to finished dimensions without necessity for any machining operations on the aerofoil surfaces.

Precision Rubbers Ltd claim that they can now offer the widest range of grades of silicone rubbers available in Europe. Their Prescolastik range comprises general-purpose, high- and low-temperature, high-tensile, low-compression-set and fuel-resistant grades, as well as HTP-resistant compounds and other special grades.

R. B. Pullin & Co Ltd At Farnborough, R. B. Pullin will be showing to the public for the first time a complete dipping Asdic equipment. Lowered into the sea by a hovering helicopter, this type of detector provides range and bearing of a submarine or other submerged target.

New among many Pullin meters and servo components is a miniature size 08 d.c. motor to drive an 08 synchro. Miniaturization is the keynote of several new instruments by the associated company Measuring Instruments (Pullin) Ltd; they include voltmeters and ammeters of vertical or horizontal "edgewise" type, with 1in scale.

Pyrene Co Ltd Improved fire-detection and indicating units, aimed towards smaller sizes and lower weight, have been developed by Pyrene and are being fitted in fuselages, fuel bays and engine nacelles of Comets, Britannias, Vanguards and other well-known aircraft. There have also been additions to the range of Pyrene hand fire extinguishers for aircraft use, fillings including dry chemical, chlorobromomethane and bromochlorodifluormethane.

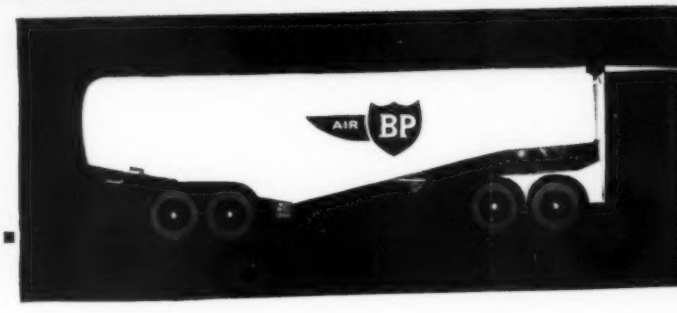
R.F.D. Co Ltd A new method of automatic inflation of the S.S. Mk 5 single-seat liferaft is being developed by R.F.D. in conjunction with the Walter Kidde Co. The object is to relieve the pilot of as much mental and physical effort as possible. Provided he can eject successfully from his aircraft the rest can be left to the liferaft. The raft is equipped with a small-diameter high-pressure tube attached to the outside of the main buoyancy tube. The h-p tube inflates first and spreads the dinghy beneath the pilot ready for inflation after a pre-determined interval.

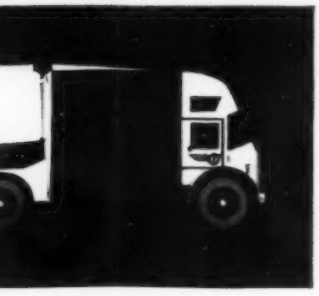
Rotax Ltd. Among new electrical generating equipment, an outstanding development is a range of 400c/s static inverters utilizing silicon-controlled rectifiers, which have been designed to replace rotary inverters and their associated control panel. By utilizing silicon-control rectifiers it is possible for large power inverters, able to withstand high voltage supply transients and with large overload capabilities, to be produced without paralleling semiconductor elements. Reliability is also improved, since fewer components are required in the control circuits and the inverters have higher temperature ratings. The present range of static inverters includes 75, 350 and 1,000VA units for single-phase systems and 1, 3 and 225kVA for use in three-phase systems.

Among rotating machines, particular effort is being applied to the development of brushless alternators, some of which can operate frequency-wild over a wide range of speeds. One of the largest brushless alternators is a 50kVA unit, while another has a continuous rating of 144A at 208V at 6,400 r.p.m. at 0.8 power factor and incorporates blast and fan cooling together with an overheat detector. Rotax have produced a new electric starter for the Rolls-Royce Tyne turboprop, which is rated for one minute at 17.5 b.h.p. at 2,250 r.p.m. operating on 28V d.c. The company have continued to develop a wide range of control and protection units, switchgear and timers, miniature motors and electric actuators of all kinds. An accompanying photograph shows an unusual linear-output actuator driven by no fewer than three motors. Two of the motors are a main and auxiliary drive operating at 28V d.c., while the other is a 115V, 400c/s a.c. drive normally used in conjunction with a servomechanism.

L. A. Rumbold & Co Ltd have during the past year introduced a series of double and treble aircraft units suitable for exceptionally high-density seating arrangements. Available in both fixed

Fast flying airlines . . .





. . . fast fuelling

AIR BP

London bystanders see, overhead, the airliners of most nations as they ply to and from London Airport: among them, most of the airlines fuelled by AIR BP on the world's air routes.

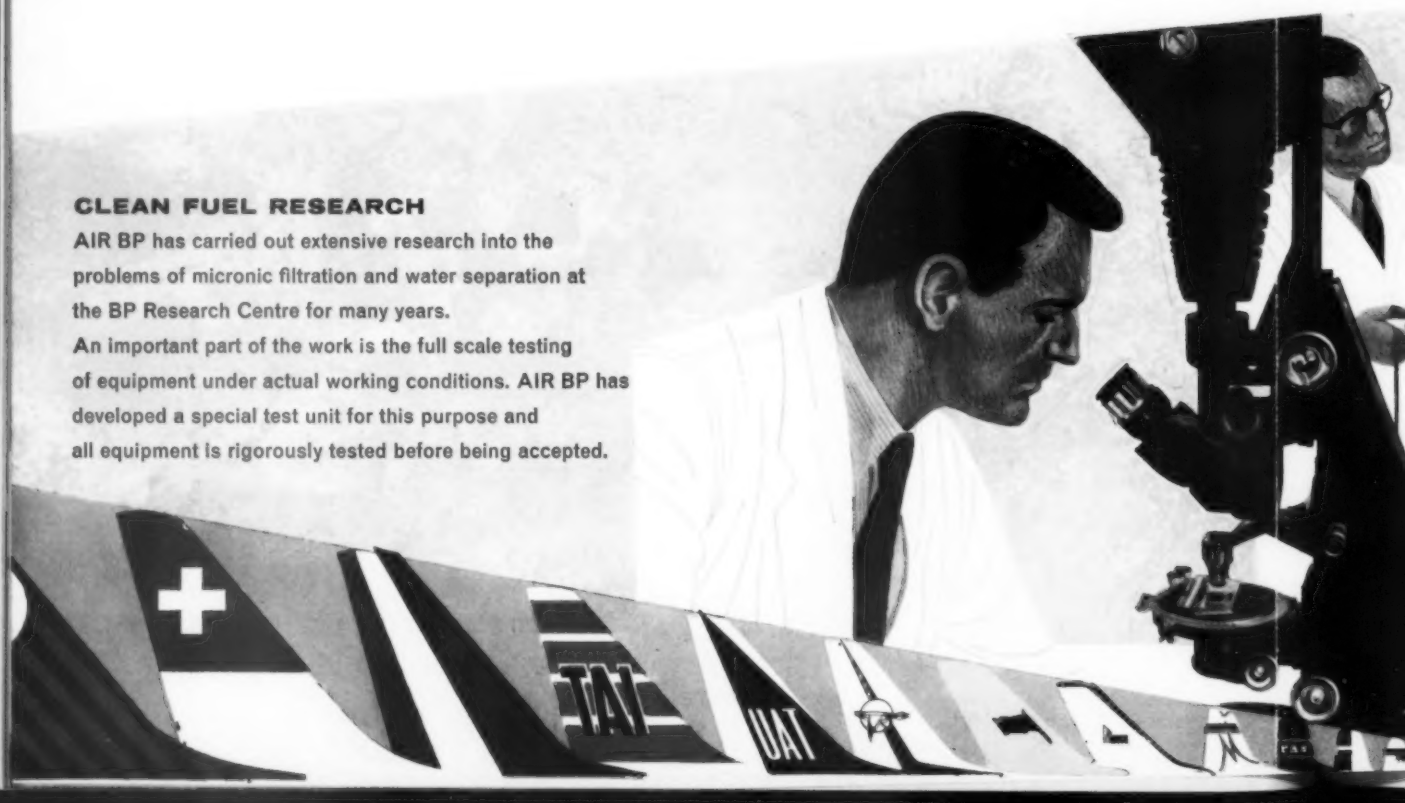
HIGH SPEED FUELLING

AIR BP has developed new high-speed fuelling methods with mobile Superfuellers. These are capable of fuelling at flow rates far greater than current aircraft can accept, and are thus equal to the demands of more advanced types to come.

MOST OF THE WORLD'S INTERNATIONAL AIRLINES ARE FUELLED BY AIR BP

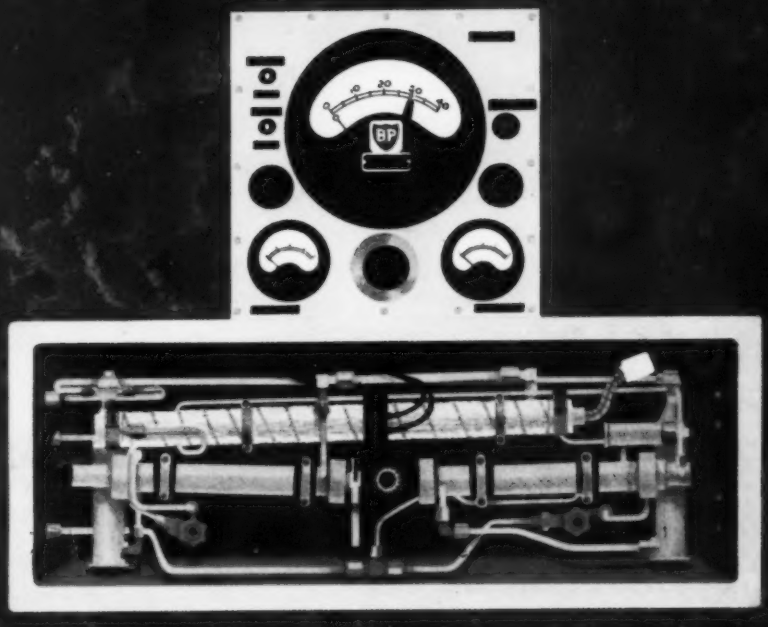
CLEAN FUEL RESEARCH

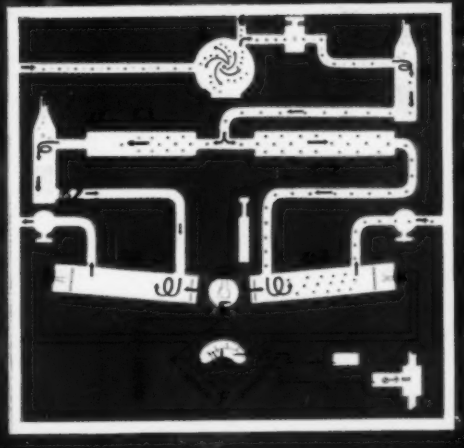
AIR BP has carried out extensive research into the problems of micronic filtration and water separation at the BP Research Centre for many years.
An important part of the work is the full scale testing of equipment under actual working conditions. AIR BP has developed a special test unit for this purpose and all equipment is rigorously tested before being accepted.

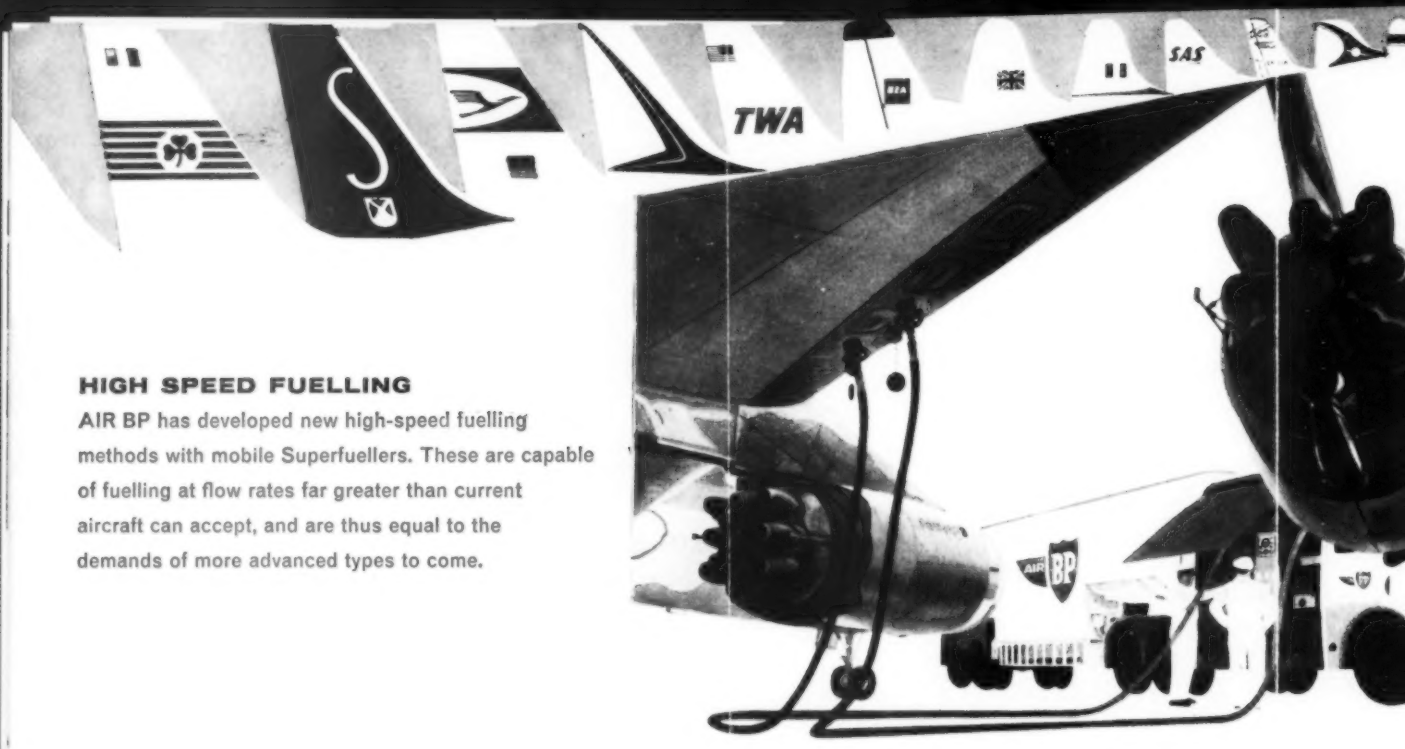


AIR BP

Now AIR BP Clean Fuel Research produces BP AQUASCAN







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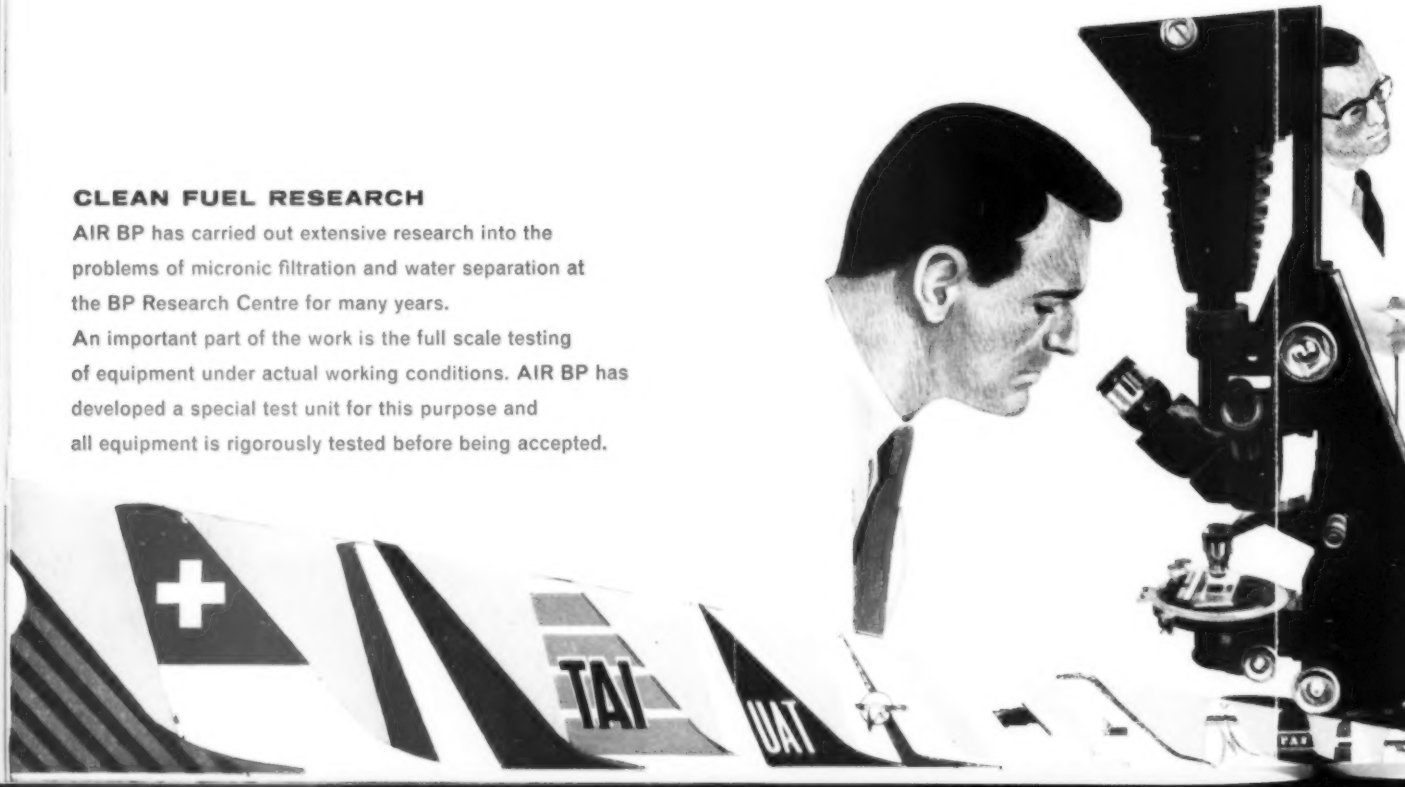
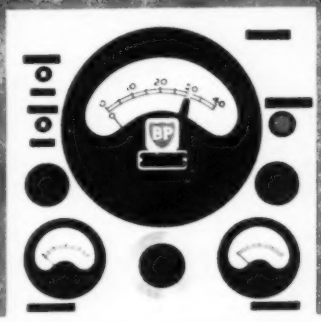
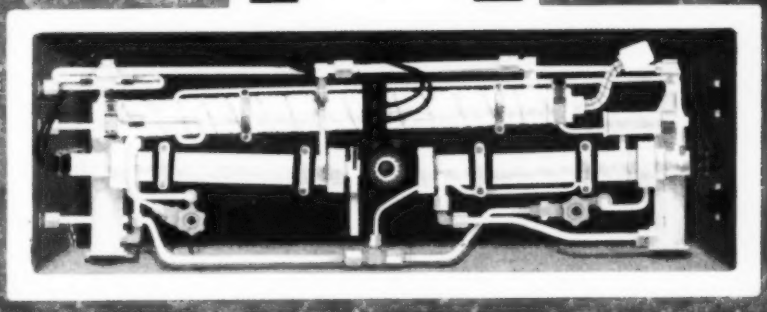


RESEARCH has a beginning, but—in AIR BP—no end. The guiding purpose of this continuous process is to be ready in advance of new requirements, so that whatever the aircraft industry may bring forth, a complete AIR BP service will exist capable of meeting all new demands in fuel specifications and fuelling techniques.

Now AIR BP Clean Fuel Research produces

BP AQUASCAN





This new instrument continuously samples every gallon of fuel during delivery for the presence of undissolved water. This is the first successful device of its kind—simple and compact, ideal for practical airport service. BP AQUASCAN is the latest development in the AIR BP Clean Fuel Research programme and will consolidate the Company's leadership in this vital sphere.

As fuel is delivered, a continuous sample is drawn through a disperser (A) and air separator (B1).

Half of this sample is then heated (C2) to remove any suspended water and enters one cell of the comparator (D1) via a further air separator (B2).

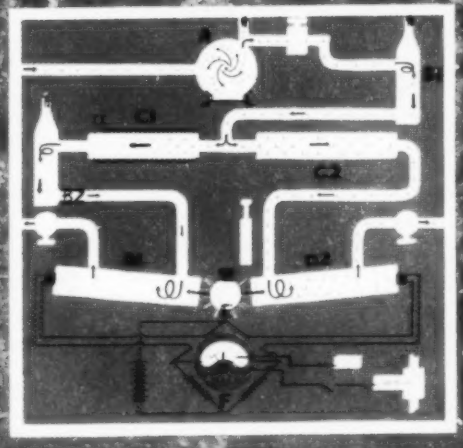
The remainder passes directly into the other cell (D2) through a Balance Cell (C2).

Light from a single source (E) is passed through both cells and compared photo-electrically.

Any undissolved water in the unheated sample will cause more light to be absorbed than in the heated sample.

This difference in light absorption is measured on a dial (F) calibrated in parts per million undissolved water to fuel.

When a pre-set limit is reached, delivery of fuel is immediately cut off.



BP Aquascan *continuously* samples fuel for undissolved water: *automatically* cuts off fuel delivery at any predetermined setting if unacceptable amounts of undissolved water are present. BP Aquascan, now being fitted to AIR BP fuellers, is a major technical achievement.

AIR BP

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Pressurised civil or military jet-prop transports; 56 passengers or 6½ tons of freight or combinations of both at 275 m.p.h. for 850 miles; operates from 1000-yd. grass airstrips; built for long life and easy maintenance; penny-a-passenger-mile economy.

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Olympus turbojet powers . . .
Avro Vulcan Mks 1 & 2 V-bombers
BAC TSR 2 tactical/strike aircraft

Pegasus turbofan powers . . .
Hawker P 1127 VTOL strike aircraft
Fokker/Republic VTOL fighter

Sapphire turbojet powers . . .
Gloster Javelin all-weather fighter
Handley Page Victor Mk 1 V-bomber

Orpheus turbojet powers . . .
Fiat G 91 strike fighter
Fiat G 91 T trainer
Folland Gnat light fighter
Folland Gnat trainer
Fuji TIF 2 trainer
Hindustan HF 24 fighter

Viper turbojet powers . . .
De Havilland Jet Dragon executive transport
Piaggio/Douglas 808 executive transport
Hunting Jet Provost trainer
Macchi MB 326 trainer
GAF Fairey Jindivik target drone

Proteus turboprop powers . .
Bristol Britannia airliner
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Thor ramjet powers . . .
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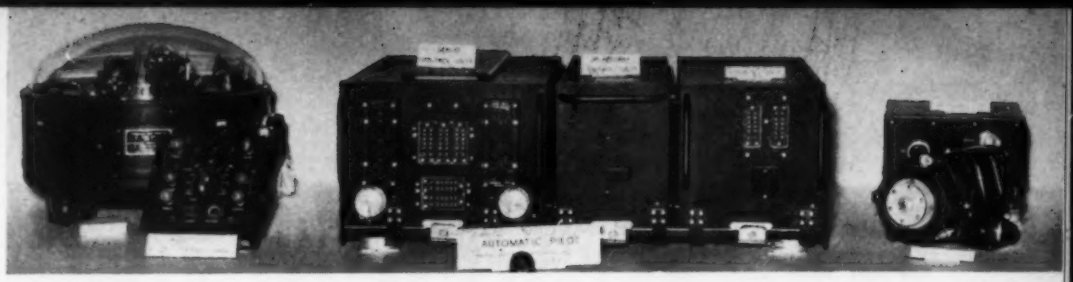


Smiths equipment for BLEU Autoland system: gyro, autopilot panel, locking unit, servo motor and manometric unit

NEW from the ACCESSORY INDUSTRY . . .

and adjustable types, these seats can be easily modified to suit any special requirement, and the legs are of the indexing type so that they can be used in a variety of aircraft. A "Sleepair" type of seat has also been produced.

Saunders Valve Co Ltd have introduced a number of variations of their motorized spherical plug valves. Apart from the two-way standard unit with its built-in motor, which accommodates a 2in valve within a space of 0.09 cu ft, there are now twin-geared, fail-safe and double-pole switched units to meet aircraft fluid-control requirements.

Examples of multi-way units to be shown at Farnborough will include a twin-valve unit driven in tandem; designed to withstand high surge-pressures during refuelling, it performs the dual task of scavenging control and emergency transfer.

Simmonds Aerocessories Ltd Known for many years as specialists in stiffnuts and similar devices, Simmonds will be exhibiting at Farnborough a new range of lightweight all-metal (i.e., without fibre or other inserts) stiffnuts designed specially for use in aircraft powerplants and other situations where very high temperatures may be encountered.

Smiths Aviation Division are this year making their main exhibit a flight-control system for a modern transport, featuring items now in production for the Trident airliner and Belfast freighter. Both aircraft have the SEP.5 autopilot, and have been designed from the outset for fully automatic landing. This multiplex autopilot is the first in the world to meet the stringent safety requirements for blind-landing passenger aircraft, and is "the outcome of the largest and most exhaustive research and development programme . . . in the history of automatic flight control." Smiths are already in production with an autopilot, auto-throttle and locking unit for the BLEU Autoland system, currently being installed in certain classes of RAF operational aircraft.

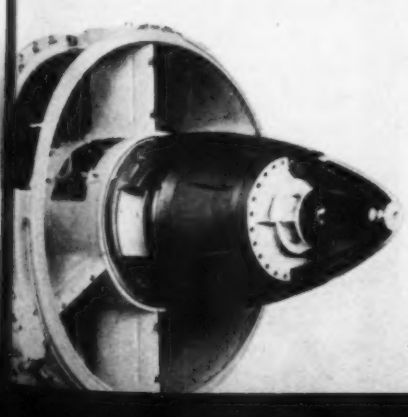
Initially the Trident will have a duplex system, and will go into BEA service certificated for auto-flare. This will obviate the need for ground guidance, and will allow crew-confidence to build up gradually. At this stage, the aileron channel will be disengaged as soon as the runway is visible, the pitch channel remaining operative and the pilot being further assisted by Para-Visual Directors. In the Belfast the triplex level will be established for fully automatic landing when the aircraft enters RAF service.

Smiths emphasize that the use of such multiplex systems will also bring benefits in cruising flight, in allowing the possibility of autopilot malfunction to be ruled out, and an optimum flight-plan carried out on every trip.

Among Kelvin Hughes instruments special mention should be made of the split-pointer ASI ordered as a stand-by for the Trident's servo-operated ASIs, and the digital-counter plus pointer precision altimeter. Both these have now been selected for the VC10, in which the two ASIs for the pilots will have a third striped pointer, operated by its own altitude capsule, to indicate Vno. A settable Vr (rotation) index is also provided.

Among a wide range of other new equipment, the most notable are the 2in split-pointer tachometer (Gnome-Wessex Mk 2), KLG thermocouples and ignition systems for most new turbine engines, the Waymouth Type 4 fuel-contents system (Belfast, Trident and VC10), the Para-Visual Director (in the Boeing "dash-80" and a KLM DC-8), the Series 4 miniature rate gyro, with an overhaul life of 3,000hr, the new Kelvin Hughes rear-looking periscope for the VC10, and the resurgence of light-aircraft instrumentation (the Beagle B.206 prototype has more than 30 Smiths Group instruments).

George Spencer, Moulton & Co Ltd, a member of the Avon Group, specialize in precision rubber products for sealing and anti-vibration purposes. On the Britannia, for example, the jetpipes are mounted in attachments incorporating special silicone rubbers capable of operating at 320°C; whereas the Westland Scout helicopter is fitted with protector bellows to keep dirt away from exposed joints and flexible couplings which may be in contact with a variety of fuels and lubricants at temperatures between minus 40 to 97°C. Many of the company's products have been progressively improved by the introduction of new materials; the Britannia again provides an example, for the hot-air sealing at the start of the thermal ice-protection system was originally manufactured in a nitrile rubber, then appeared in a specially compounded silicone rubber and is now made in a special fluorocarbon rubber with excellent tear resistance.



Noelle gas-turbine starter (Teddington Aircraft Controls Ltd). Peak power is 55lb, total weight 61½lb and size 21½ in long by 13¾ in diameter

Sperry Gyroscope Co Ltd At Farnborough this year the company will be showing for the first time its FB3 lightweight autopilot, designed to offer "airliner precision and reliability" for executive-type aircraft at economical cost. The full three-axis system weighing 27lb can be built up as occasion demands from a simple single-axis SP3 weighing only 11lb. Automatic altitude control is available now, and radar beam and Gyrosyn compass couplers will follow shortly.

Another Sperry product to be exhibited for the first time is the twin gyro platform. With a very low free-drift rate, and offering an attitude reference of high quality and reliability, these units are now in production for NATO forces.

Teddington Aircraft Controls Ltd have acquired UK and Commonwealth rights to supply a range of equipment, principally in the air-conditioning and turbine-starting field, made by the French company Ateliers SEMCA. One such product is the Noelle 60 starter, which comprises three units, a gas generator, a free-turbine and associated accessories. The latter include fuel pump, a small electric-motor starter, and relays and contactors to monitor and control the operating sequence.

Unbrako Socket Screw Co Ltd Latest products of Unbrako AD, the Advanced Design Division of this company, include the Milson stressed panel fastener. Describing its characteristics, Unbrako say that "this fastener pulls itself in and jacks itself out and will compensate for panel mis-match up to 0.060in; it is therefore ideal for residual shear applications". Available in three diameters and for a wide range of panel thicknesses, it has hexagon sockets or high torque drive and is self locking.

Williamson Manufacturing Co Ltd Among the aerial cameras to be featured in the company's Farnborough exhibit is the latest in the 117 range, the F.117E, which is a hand-held instrument operated by an electric motor powered from a lightweight rechargeable battery. It conforms to MoA specification Av.P24 "for use in highly manœuvrable aeroplanes (class A) category 3".

Wilmot Breeden Ltd are, in the aeronautical sphere, renowned for the manufacture of hollow aerofoil-section blades, particularly inlet guide vanes and stator blading for compressors and turbines. Extensive research is leading to progressive improvements in the design of heat-exchanger matrix elements, and the associated company Telehoist Ltd are in production with the high-performance range of Pegasus servo valves which have many aircraft and missile applications.

NEW from the ACCESSORY INDUSTRY . . .

RADIO AND RADAR

Burndept Ltd Latest product is a hand-held audio amplifier into which four head-sets may be plugged to provide intercom service either in very noisy areas on the ground or in aircraft. The unit contains four transistors in a three-stage amplifier and has an on/off and volume control.

A. C. Cossor Ltd A most important factor for Cossor Radar and Electronics Ltd is the recent MoA announcement that secondary radar is to be progressively introduced in United Kingdom radar coverage and that all airliners flying at above 25,000ft over Britain will soon be required to carry transponders.

Latest of the series of oscilloscopes from Cossor Instruments Ltd is the Model 2000, a small, portable double-beam instrument incorporating a four-inch c.r.t. in which the entire screen area can be utilized. Wider band-width and higher writing speeds are offered by the 2100.

Decca Navigator Ltd While development of the Omnitrack computer and self-setting displays for Decca Navigator continue, the company has also produced a number of new pictorial navigation displays. The Mk 8 receiver in ATR-size cases is in service.

Decca Radar Ltd Reliabilities of better than 99.8 per cent have been achieved in the electronic circuitry of a complex radar display system by the application of environment stabilization. Circuit components and transistors are mounted in insulated cabinets and maintained by an integral refrigeration unit and heat exchanger at a temperature constant to within ¼°C and at constant humidity. A prototype unit has already exceeded 10,000hr of operation. Transistors can thus be used where performance and circuit stability must be very high; and reliability is greatly improved. Production units for a military project are already being completed.

Decca Radar are announcing two new weather radars, the Type 43, a 3cm unit with narrow vertical beam-width to display vertical structure of storm centres, and the Type 44, a 750kW, 10cm unit for long-range detection of precipitation and cyclones.

Ekco Electronics Ltd A further reduction in the weight of the E190 weather radar from 60lb to 46lb, by the introduction of a smaller and lighter scanner, now makes the unit suitable for installation in executive aircraft.

Elliott Brothers (London) Ltd New products this year include the Bendix Doppler radar, which is to be made under licence, and the Verdan airborne digital computer licensed from the Autonetics Division of North American. It is now confirmed that Elliott make the autopilot for the Lightning; and production of the flight-control system, with automatic landing, for the VC10 is in hand.

Ferranti Ltd Apollo, the traffic control computer for Prestwick, is nearing completion. Ferranti have now also developed the Type 100, intermediate-size inertial navigation platform, which is fully manœuvrable, carries three accelerometers and is stabilized by three flotation gyros. Short-term inertial navigation facilities are provided, but the high-quality heading output allows effective long-term navigation with Doppler.

The Integrated Strike and Intercepter System sight for gun- and rocket-aiming and for loft-bombing and heading-holding is to be evaluated in four versions in Fiat G.91s by the German Defence Ministry.

Halpins of Hampshire Ltd MoA approval is now being sought for the ingenious combined ADF and VOR receiver for light aircraft. The indicator is a miniature c.r.t. and the complete equipment should cost little more than £200.

Marconi's Wireless Telegraph Co Ltd First details have just been released concerning a development expected to go into production in 1963. This is the SD.1015 display unit which for the first time will combine raw radar information and synthetic radar signals on the same screen and in a compact cabinet. Low-current time-base for the PPI trace has been retained, and the high deflection speeds required for character writing are provided by transient boosting of the current. Because the high-voltage periods are of short duration, large valves are not required. The 12in PPI tube is mounted in a cabinet only 14in high, 14in wide and 28in long. Up to 200 aircraft traces can be displayed at any one time.

Another innovation is the SD.1016 tabular display in which alpha-numeric characters from a digital data processing system are displayed on a bright 7in x 5in rectangular c.r.t. The characters are fed into a buffer store from which the c.r.t. is controlled and one figure at a time can be altered as new information is received.

Decca Radar transistorized display drive equipment in temperature-stabilized cabinets

Latest of the series of parametric amplifiers is an experimental crystal diode unit. Important new developments in closed-circuit television are in prospect.

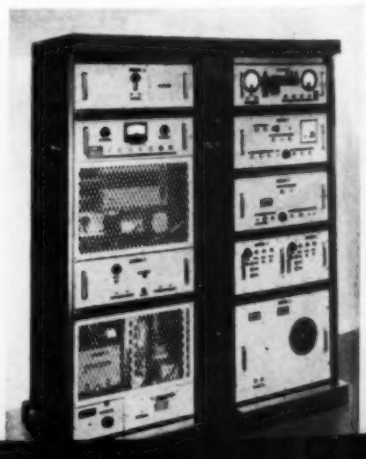
The Solartron Electronic Group Ltd This company has now produced the first fully transistorized radar simulator available on the commercial market. Most of the facilities incorporated in operational radars can be reproduced: reliability and accuracy are improved and the system is flexible.

Standard Telephones and Cables Ltd A new development just announced is the STR-37 lightweight, fully transistorized radio providing 400 channels at 50kc/s spacing between 116.0Mc/s and 135.95Mc/s. The transmitter/receiver unit measures only 5¾in x 3¾in x 8in deep, and amplifiers for either 6W or 25W power output may be added. Equivalent ILS/VOR/Marker receivers and instrument drive unit are available. The STR-37 is suitable for executive aircraft. A new, simplified, wide-aperture DF system based on the Doppler principle and intended for civil secondary airfields is also announced.

Thermionic Products (Electronics) Ltd Added to the range of tape recorders this year are the Series IV six-channel unit for small airports and the Eight-Speed Data Deck for digital recording.

Ultra Electronics Ltd Now announced is the 2A7 series radio beacon, transmitting on 243Mc/s a signal which can be detected by normal operational receivers. Two-way speech is also provided. The new Radiopage system allows up to 100 people to be individually called at ranges between one and five miles.

Left to right, the Marconi SD.1015 radar display and 1016 tabular display unit in a combined console; Standard Telephones and Cables STR-37 400-channel VHF radio; and the radar head cabinet of the Cossor CR.787 surveillance radar



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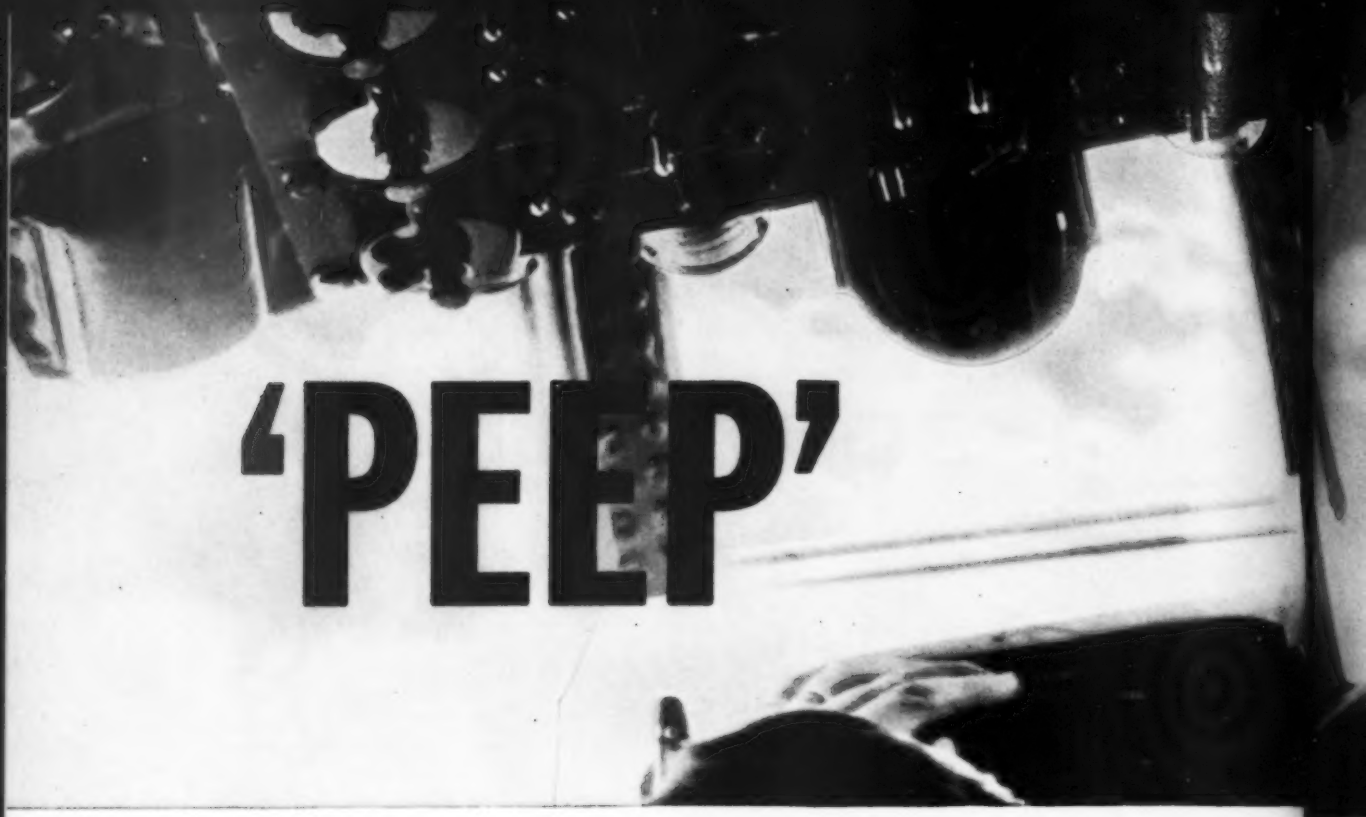


'PEEP'

'PEEP' integrates these five n

The Cintel Pilot's Electronic Eyelevel Presentation system (PEEP) is a radical new method of presenting to the pilot essential flight data in an easily seen and assimilated form.

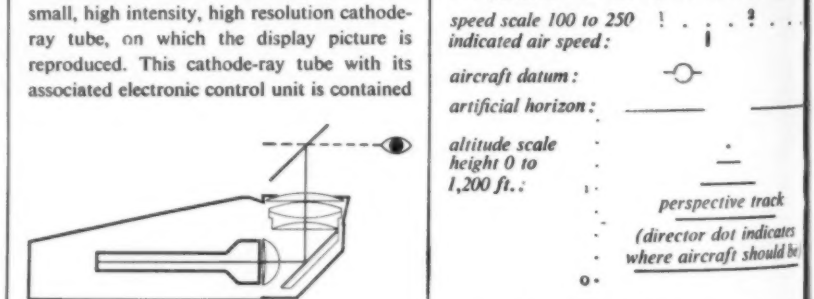
PEEP'S CONCEPTION is based on the philosophy that the ideal place to present flight data to the pilot is directly in front of him, at eye level, in line with the aircraft's flight path.

On this basis, Cintel have developed for the Ministry of Aviation the PEEP system whereby information enabling the aircraft to be flown on course, at the correct height and airspeed, is presented directly in front of the pilot — on the windscreen. The display is transparent, allowing objects to be seen *through* the display, and the pattern is collimated; i.e. focused at infinity. The information is, therefore, focused at the correct distance for the pilot when he is looking ahead of his aircraft . . . appearing as if it were part of the sky path outside.

The heart of this revolutionary system is a small, high intensity, high resolution cathode-ray tube, on which the display picture is reproduced. This cathode-ray tube with its associated electronic control unit is contained

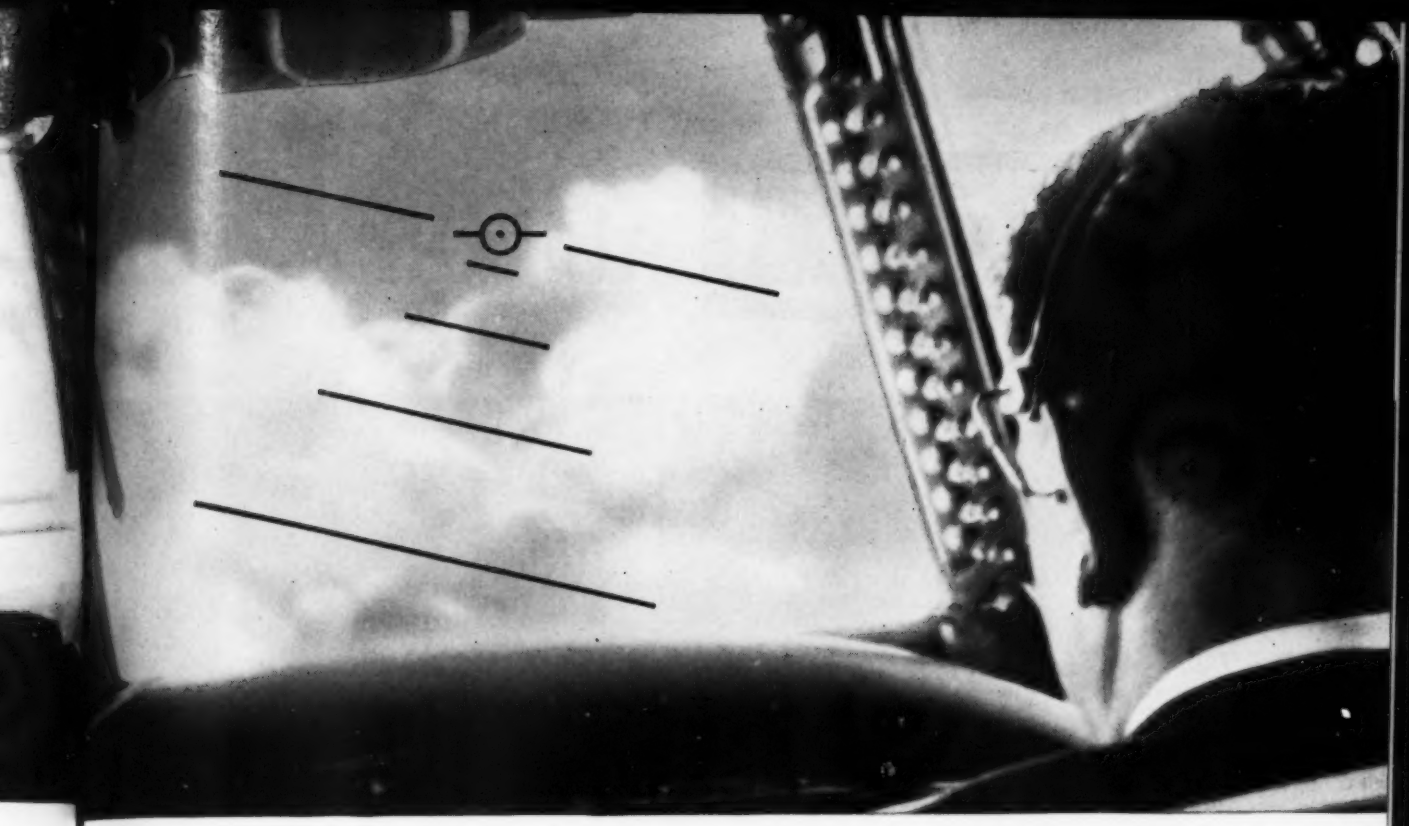
within a compact, lightweight casting known as the Pilot's Display Unit. Combined with the unit is a lens system which projects an image of the display picture on to a reflecting screen situated at eye level in front of the pilot, or on to the windscreen itself. The amount of information presented by the display is dependent upon various operational requirements.

The pattern, with the symbol identification

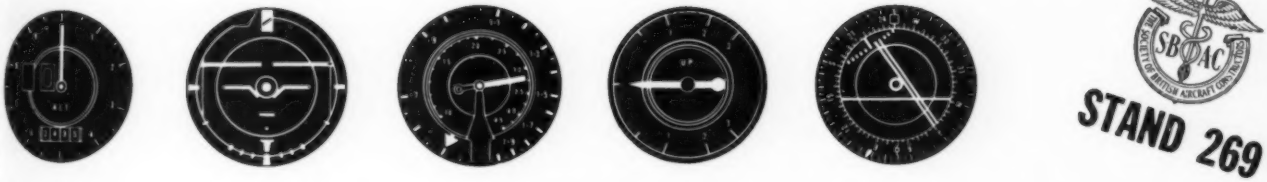


The *air speed* and *altitude* scales can be selected to appear on the display as and when required.

The main advantage of the PEEP system is that the information presented is self-evident and is easily assimilated. Eyestrain on the part of the pilot is considerably reduced with the removal of the need for frequent and hurried refocusing from the infinity of the outside view to the close proximity of his

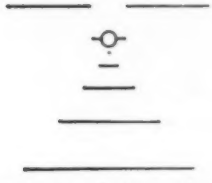


ve normal flight data sources!

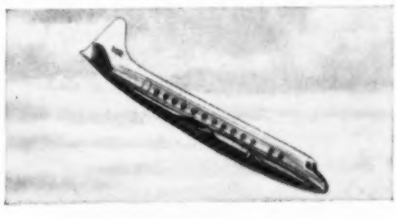


SBAC STAND 269

Banking information in relation to the aircraft datum



Pitch information in relation to aircraft datum



instrument panel. The maximum brightness of the display is sufficient to render it visible against the brightest cloud edge. Yet it can be automatically controlled to give a very low brightness level for night flying. Once set by the pilot, this brightness level can be made to vary automatically, adjusting itself to changing conditions of natural background illumination. The system, via its coupler unit, will accept all normal signal sources associated with conventional meter presentation, and can be so arranged as to present *absolute* bearing, height, speed, etc., or *deviation* from a given set of data such as bearings etc.

Storm warning and collision warning can be displayed if the relevant radar information is available, and other information symbols can be added as and when desired.

The equipment is completely transistorised, and meets all the stringent requirements of military users. Displays applicable to helicopters, or VTOL aircraft, can be provided. **Full technical details are available on request.**

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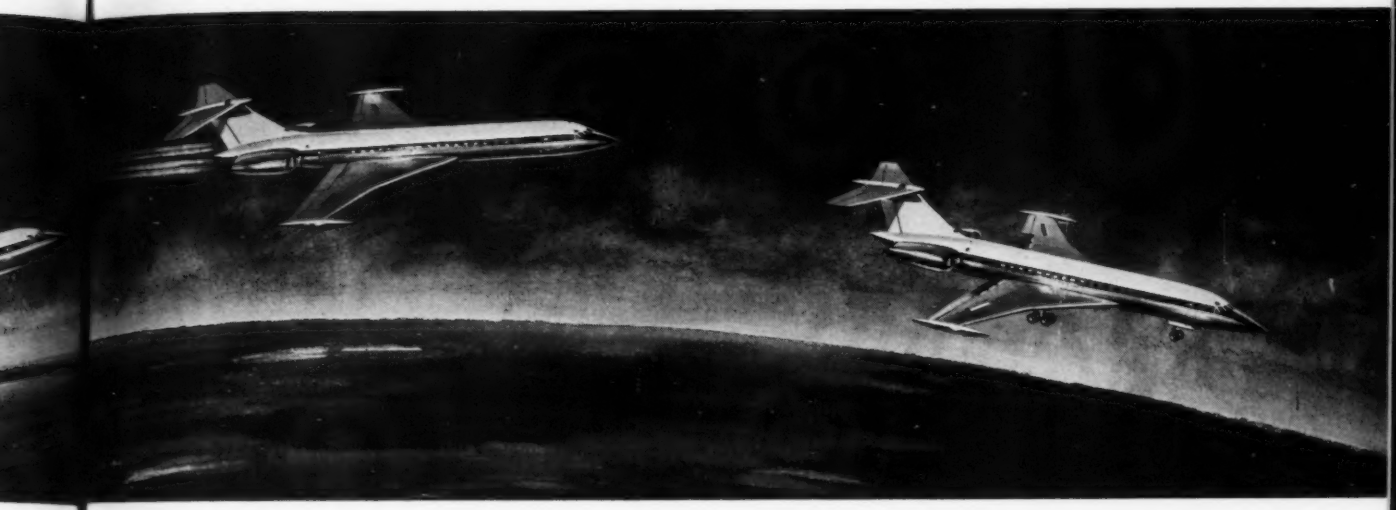
Such an achievement demands sophisticated equipment—tried and tested under all conditions. Elliotts alone are in a position to provide all the necessary equipment from within one group. Very soon Elliotts will transform this dream into reality with an achievement which, a generation hence, will likewise be taken for granted—as indeed are all great achievements.

Visit our Stands 253/254 at FARNBOROUGH

Elliott Brothers (London) Limited invite you to visit Stands 253 and 254 at Farnborough. In the Radar area outside the Exhibition Tent there will also be a Special Demonstration of some of the many different uses of an Elliott general purpose digital computer in the world of aviation.

... take-off to touch-down



In the arrangement shown diagrammatically above, an airborne digital computer co-ordinates all navigational information, which is communicated to the destination point, where the ground computer fits the aircraft's arrival into the landing pattern. Throughout the flight the airborne computer communicates with the pilot, giving information on track and fuel management.

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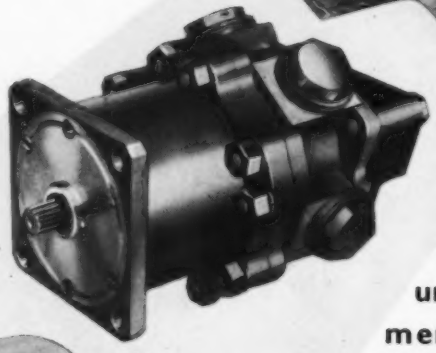

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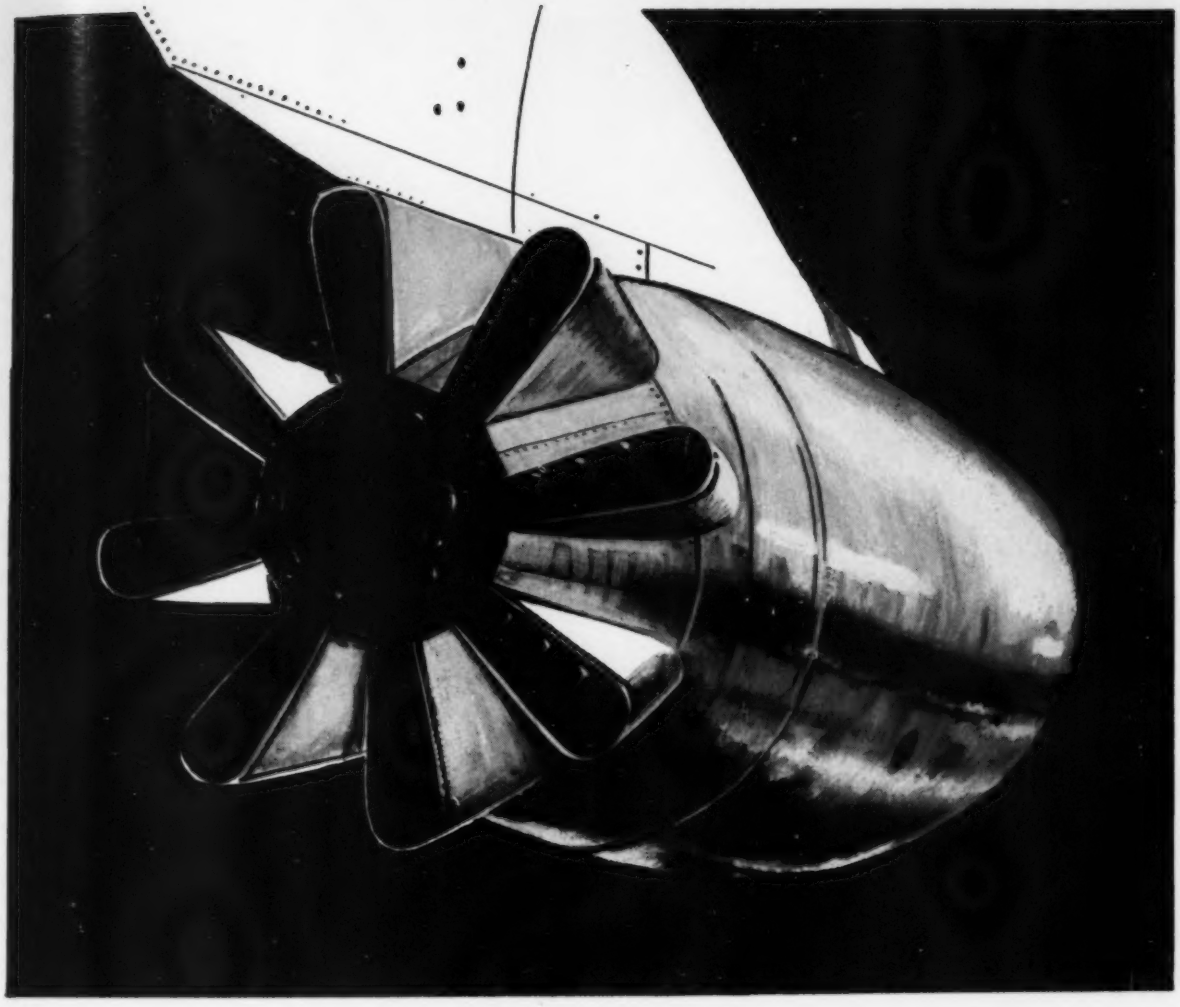

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1944 *Rotor and stator blading of Nimonic Alloy were used for the Rolls-Royce 'Welland' turbines of Britain's first operational jet, the Gloster Meteor Mk. 1.* **1961** *Nimonic alloys serve for high-temperature components in the Rolls-Royce 'Conway' by-pass power unit for many Boeing 707's of the world's leading airlines.*

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TGA 455

Ekco transistorised airborne Weather Radar systems are designed for all types of modern aircraft

STANDARD The standard Type E190 radar, as supplied or scheduled for many of the world's latest airliners, consists of a scanner, transmitter/receiver and indicator and weighs under 60 lb.

LIGHTWEIGHT By using a new, lighter scanner, we have reduced the weight to 46 lb. which makes the equipment suitable for installation in smaller executive and private aircraft.

DUPLICATE The Ekco Duplicate System has a total weight of only 103 lb.—less than half that of other single systems. It provides full 'fail-safe' conditions, either transmitter/receiver unit operating with either indicator unit.

See the Ekco Weather Radar Systems on our Stand 193/194 at Farnborough, together with Transistor Inverters and Automatic VHF/DF Equipment

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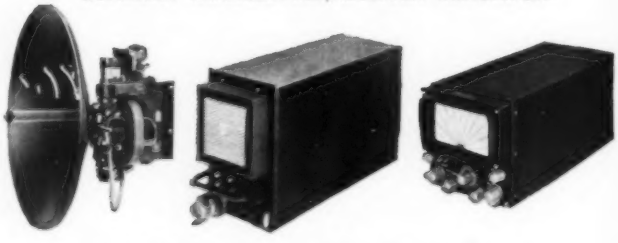

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WPS-377

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A "FLIGHT" READY-REFERENCE DIRECTORY TO PRODUCTS AND COMPANIES

Ancillary Industry 1961

IN this annual directory section of "Flight" nearly 500 components, accessories, services, etc., are listed in quick-reference form, and under the headings are names of over 650 United Kingdom firms whom we understand to be actual manufacturers of such items. Their addresses, with telephone numbers, are given alphabetically on pages 350-351. Aircraft engines and missiles are dealt with in the special reviews earlier in this issue, as are new developments in certain classes of major equipment. "Aerial work" operations are not included here; they have their place in other of our special numbers. A great many of the items named are obtainable through agents, such as those listed under specific "Agencies and distributors" headings. Stand numbers of firms at the SBAC Show are on pages 357-358.

A.G.S. PARTS

Acton Bolt Ltd
Aeronautical Trades & Manufacturing Co Ltd
Aircraft Materials Ltd
Aircraft Supplies (Bth) Ltd
Avdel Ltd
B.M.B. (Sales) Ltd
Baxters (Bolts, Screws & Rivets) Ltd
Brooklands Aviation Ltd
Brown Bros (Aircraft) Ltd
Coin Insulation Ltd
Cross Manufacturing Co (1938) Ltd
Curd Components Ltd
Guest Keen & Nettlefolds (Midlands) Ltd
Hickman Ltd
High Pressure Components Ltd
Kautex Ltd
Lentern (Aircraft) Ltd
Miller Aviation Ltd
R.F.D. Co Ltd
R.M.R. Engineering
Rawlplug Co Ltd, The
Ross, Courtney & Co Ltd
Rubery Owen & Co Ltd
Simmonds Aerocessories Ltd
Spa Guilds Ltd
Spring Washers Ltd
Stone & Co (D ptford) Ltd, J.
Tucker Eyelet Co Ltd, G2o.
Unbrako AD
Vandyke Engineering Ltd
Villiers (Tool Developments) Ltd
Whitehouse Industries Ltd (Philidas Division)

ACCELEROMETERS

de Havilland Aircraft Co Ltd, The
English Electric Aviation Ltd (Guided Weapons Division)
Ferranti Ltd
Graseby Instruments Ltd
Hendrey Relays Ltd
Mechanism Ltd
Newmark Ltd, Louis
Salford Electrical Instruments Ltd
Smiths Aviation Division
Southern Instruments Ltd
Sperry Gyroscope Co Ltd
Technical Ceramics Ltd
Wilmot Mansour Ltd

ACCESS EQUIPMENT

Aero Controls Ltd
Aircraft Ground Equipment Ltd
Aviation Traders (Engineering) Ltd
Bristol Aircraft Ltd
Didsbury Engineering Co Ltd
Edghill Equipment Ltd
Gloster Aircraft Co Ltd
Lancefield Aircraft Components Ltd
Mercury Airfield Equipment Ltd
Simon Engineering Dudley Ltd
Taylor (Plastics) Ltd, C. F.

ACCUMULATORS, HYDRAULIC

Boulton Paul Aircraft Ltd
Dowty Rotol Ltd
Dunlop Rubber Co Ltd
Electro-Hydraulics Ltd
Fairey Engineering Ltd
H.M.L. (Engineering) Ltd
Hydraulics & Pneumatics Ltd
Lockheed Precision Products Ltd
Sperry Gyroscope Co Ltd

ACTUATORS

Boulton Paul Aircraft Ltd
de Havilland Aircraft Co Ltd, The
Dowty Rotol Ltd
Dunlop Rubber Co Ltd
English Electric Co Ltd, The
Fairey Engineering Ltd
Graseby Instruments Ltd
Hobson Ltd, H. M.
Hydraulics & Pneumatics Ltd
Hymatic Engineering Co Ltd, The
Lockheed Precision Products Ltd
Miles Engineering Ltd, F. G.
Mitchell Hydraulics Ltd
Newmark Ltd, Louis
Normalair Ltd
Palmer Aero Products Ltd
Plessey Co Ltd, The
Ross Ltd, S. Grahame
Rotax Ltd
Sperry Gyroscope Co Ltd
Teddington Aircraft Controls Ltd
Vactric Control Equipment Ltd
Vandyke Engineering Ltd
Western Manufacturing (Reading) Ltd

ADHESIVES

Aircraft Materials Ltd
B.B. Chemical Co Ltd
Bakelite Ltd
British Paints Ltd
CIBA (A.R.L.) Ltd
Imperial Chemical Industries Ltd
Kane (Sealants) Ltd, Douglas
Kautex Ltd
Kenilworth Manufacturing Co Ltd, The
Lea Bridge Industries Ltd
Rawlplug Co Ltd, The
Surridge's Patents Ltd
Titanine Ltd

AERIALS (AIRCRAFT RADIO, ETC) AND EQUIPMENT

Armstrong Whitworth Aircraft Ltd, Sir W. G.
Belling & Lee Ltd
Chelton (Electrostatics) Ltd
Clifford & Co Ltd, Peter S.
Cossor Radar & Electronics Ltd
Girdlestone Pumps Ltd
McMichael Radio Ltd

[*Continued overleaf*

ADDRESSES OF COMPANIES: pages 349-355

ANCILLARY INDUSTRY 1961..

Plessey Co Ltd, The
Redifon Ltd
Standard Telephones & Cables Ltd
Taylor (Plastics) Ltd, C. F.
Vandyke Engineering Ltd
Whittemore (Aeradio) Ltd, A. J.

AGENCIES AND DISTRIBUTORS, AIRCRAFT

Aerocontacts (Aircraft Distributors) Ltd
Aero-Enterprises (Boreham Wood) Ltd
Aircraft & General Finance Corporation Ltd
Aircredit Ltd
Airline Air Spares Ltd
Airwork Services Ltd
Aviation Traders (Engineering) Ltd
Clifford & Co Ltd, Peter S.
Derby Aviation Ltd
Dundas Ltd, R. K.
Field Aircraft Services Ltd
Flair Aviation Sales Co Ltd
G & M Air Interests Ltd
Helicopter Sales Ltd
Holman & Co (Engineers) Ltd
Miller Aviation Ltd
Newton & Co Ltd, H. T.
Rogers (Aviation) Ltd, W. H. & J.
Rollason Aircraft & Engines Ltd
Saywell Ltd, R. F.
Shackleton (Aviation) Ltd, W. S.
Short Bros & Harland Ltd
Vigors Aviation Ltd
Villiers (Tool Developments) Ltd
Whittemore (Aeradio) Ltd, A. J.

AGENCIES AND DISTRIBUTORS, COMPONENTS, SPARES AND SMALL PARTS

Aerocontacts (Aircraft Distributors) Ltd
Aerocontacts (Sales) Ltd
Aeronautical Trades & Manufacturing Co Ltd
Air Engine Parts Ltd
Aircraft & General Finance Corporation Ltd
Aircraft Supplies (Bth) Ltd
Airline Air Spares Ltd
Airwork Services Ltd
Aviation Traders (Engineering) Ltd
B.S.T. Aeronautical Co Ltd
Dundas Ltd, R. K.
Fox & Sons (Aviation) Ltd, C. J.
Hants & Sussex Aviation Ltd
Helicopter Sales Ltd
McAlpine Aviation
Miller Aviation Ltd
Newton & Co Ltd, H. T.
Phillips & White Ltd
Rollason Aircraft & Engines Ltd
Saywell Ltd, R. F.
Scanrad Ltd
Shackleton (Aviation) Ltd, W. S.
Staravia Ltd
Stewart Aeronautical Supply Co Ltd, The
Sutton (Consultants) Ltd, R. W.
Vigors Aviation Ltd
Villiers (Tool Developments) Ltd
Whittemore (Aeradio) Ltd, A. J.

AGENCIES AND DISTRIBUTORS, ELECTRICAL AND ELECTRONIC

Aero Electronics Ltd
Aerocontacts (Sales) Ltd
Aircraft Supplies (Bth) Ltd
Airline Air Spares Ltd
B.S.T. Aeronautical Co Ltd
Bissell Ltd, Henry
Blackburn Electronics Ltd
Dundas Ltd, R. K.
Field Aircraft Services Ltd
Hants & Sussex Aviation Ltd
Miles Hivolt Ltd
Newmark Ltd, Louis
Newton & Co Ltd, H. T.
Parker (Aircraft Spares) Ltd, W. A.
Phillips & White Ltd
Proops Bros Ltd
Scanrad Ltd
Smart & Brown (M.T.) Ltd
Staravia Ltd
Stewart Aeronautical Supply Co Ltd, The
Whittemore (Aeradio) Ltd, A. J.

AGENCIES AND DISTRIBUTORS, ENGINE

Aerocontacts (Aircraft Distributors) Ltd
Aero-Enterprises (Boreham Wood) Ltd
Aircraft & General Finance Corporation Ltd
Aircraft Supplies (Bth) Ltd
Airline Air Spares Ltd
Aviation Traders (Engineering) Ltd
B.S.T. Aeronautical Co Ltd
Bristol Aerojet Ltd
Clifford & Co Ltd, Peter S.
Hants & Sussex Aviation Ltd
Helicopter Sales Ltd
Newton & Co Ltd, H. T.
Phillips & White Ltd
Rollason Aircraft & Engines Ltd
Saywell Ltd, R. F.
Scanrad Ltd
Shackleton (Aviation) Ltd, W. S.
Staravia Ltd
Vigors Aviation Ltd
Villiers (Tool Developments) Ltd

AGENCIES AND DISTRIBUTORS, FACTORY AND AIRFIELD EQUIPMENT

Aerocontacts (Ground Equipment) Ltd
Aeronautical Trades & Manufacturing Co Ltd
Aircraft & General Finance Corporation Ltd
Airline Air Spares Ltd
Dundas Ltd, R. K.
Kane (Sealants) Ltd, Douglas

Preparing quarter-scale models of Dexion access equipment for the makers' exhibit at Farnborough

Miller Aviation Ltd
Newton & Co Ltd, H. T.
Phillips & White Ltd
Scanrad Ltd
Staravia Ltd

AGENCIES AND DISTRIBUTORS, HELICOPTER SPECIALIST

Helicopter Sales Ltd
Newton & Co Ltd, H. T.
Scanrad Ltd
Staravia Ltd

AGENCIES AND DISTRIBUTORS, INSTRUMENT

Aerocontacts (Sales) Ltd
Aircraft Supplies (Bth) Ltd
Airline Air Spares Ltd
B.S.T. Aeronautical Co Ltd
Bryans Aeroquipment Ltd
Dobbie McInnes (Electronics) Ltd
Field Aircraft Services Ltd
Miles Hivolt Ltd
Newton & Co Ltd, H. T.
Phillips & White Ltd
Scanrad Ltd
Staravia Ltd
Stewart Aeronautical Supply Co Ltd, The

AGENCIES AND DISTRIBUTORS, MATERIALS (METALLIC)

Aerocontacts (Sales) Ltd
Aeronautical Trades & Manufacturing Co Ltd
Airline Air Spares Ltd
Macready's Metal Co Ltd
Newmark Ltd, Louis
Newton & Co Ltd, H. T.
Scanrad Ltd
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

AGENCIES AND DISTRIBUTORS, MATERIALS (NON-METALLIC)

Airline Air Spares Ltd
Cox & Son Ltd, John
Kane (Sealants) Ltd, Douglas
Newton & Co Ltd, H. T.
Scanrad Ltd
Vane & Co Ltd, A. H.
Wilmot Mansour Ltd

AGENCIES AND DISTRIBUTORS, RADIO AND RADAR EQUIPMENT

Aero Electronics Ltd
Aircraft Supplies (Bth) Ltd
Airline Air Spares Ltd
Airwork Services Ltd
B.S.T. Aeronautical Co Ltd
Beme Telecommunications Ltd
Dundas Ltd, R. K.
Field Aircraft Services Ltd
Flair Aviation Sales Co Ltd
Lancefield Aircraft Components Ltd
Newton & Co Ltd, H. T.
Scanrad Ltd
Shackleton (Aviation) Ltd, W. S.
Staravia Ltd
Stewart Aeronautical Supply Co Ltd, The
Whittemore (Aeradio) Ltd, A. J.

AGRICULTURAL AIRCRAFT EQUIPMENT

Britten-Norman Ltd
Hants & Sussex Aviation Ltd
Villiers (Tool Developments) Ltd

AIR CONDITIONING AND PRESSURIZATION EQUIPMENT

Airscrew Co & Jicwood Ltd, The
Avica Equipment Ltd
B.M.B. (Sales) Ltd
Baxter Woodhouse & Taylor Ltd
Bell's Asbestos & Engineering Ltd
Bissell Ltd, Henry
British Oxygen Aviation Services
Burgess Products Ltd
de Havilland Aircraft Co Ltd, The
Flexible Ducting Ltd
Godfrey & Partners Ltd, Sir George
H.M.L. (Engineering) Ltd
Hymatic Engineering Co Ltd, The
Lucas Gas Turbine Equipment Ltd
M.L. Aviation Co Ltd
Normalair Ltd
Plannair Ltd
Serck Radiators Ltd
Stone & Co (Deptford) Ltd, J.
Taylor (Metal Workers) Ltd, C. F.
Taylor (Plastics) Ltd, C. F.
Teddington Aircraft Controls Ltd

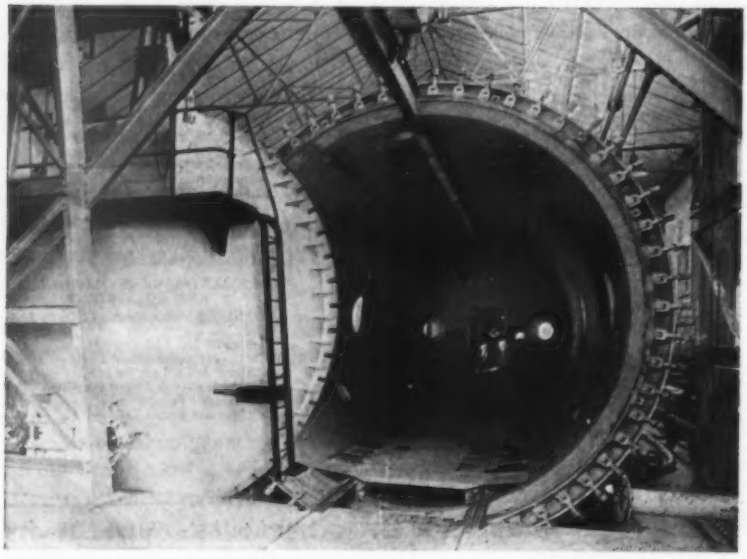
AIR SURVEY EQUIPMENT

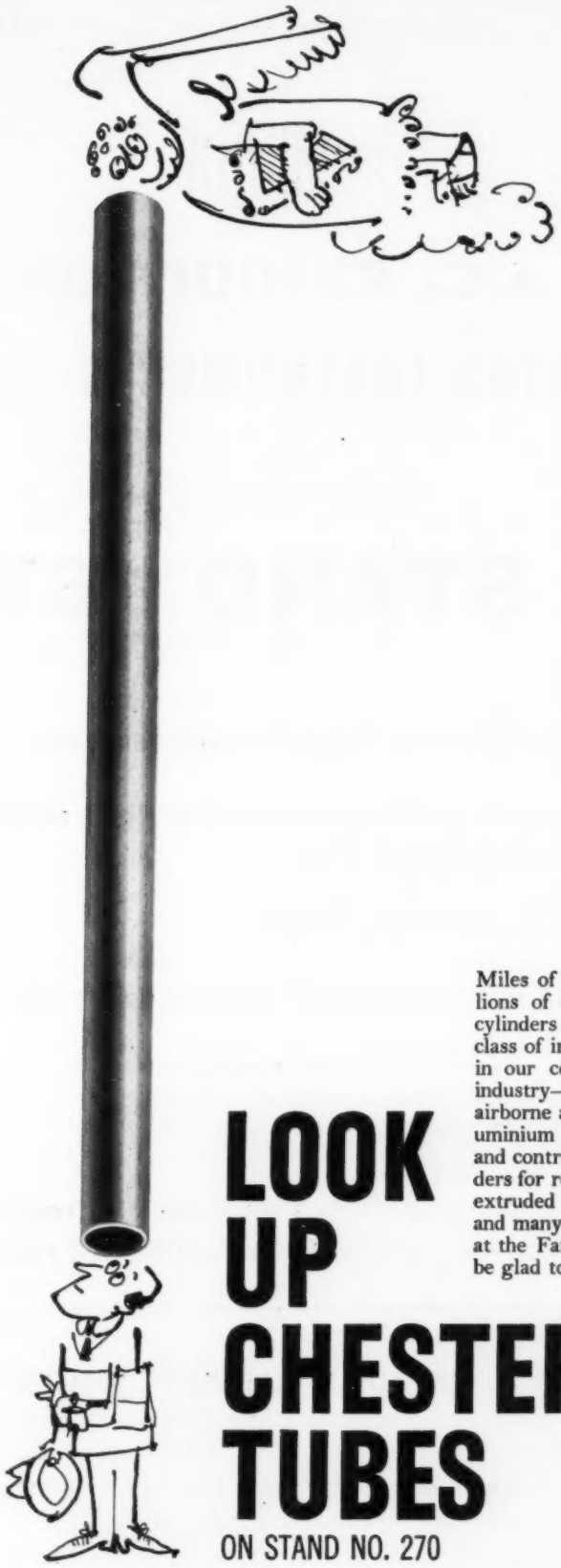
Decca Navigator Co Ltd
Dobbie McInnes (Electronics) Ltd
Fairey Air Surveys Ltd
Mechanism Ltd

AIR TRAFFIC CONTROL SERVICES AND EQUIPMENT

Airmed Ltd
Airtech Ltd
Amplivox Ltd
Cossor Radar & Electronics Ltd
Decca Navigator Co Ltd
Ekco Electronics Ltd
Ferranti Ltd
International Aeradio Ltd
Marconi's Wireless Telegraph Co Ltd
Pye Telecommunications Ltd
Racal Engineering Ltd
Redifon Ltd
Standard Telephones & Cables Ltd
Thermionic Products (Electronics) Ltd

High-altitude, high-temperature research chamber in the works of Normalair Ltd





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ANCILLARY INDUSTRY 1961...

AIRFIELD CONSTRUCTION
Costain Ltd, Richard
Douglas (Contractors) Ltd, Robert M.

AIRFIELD CONSTRUCTION EQUIPMENT
Curran Ltd, John
General Electric Co Ltd, The
R.F.D. Co Ltd

AIRFIELD MANAGEMENT
Airwork Services Ltd
Boulton Paul Aircraft Ltd
Brooklands Aviation Ltd
Derby Aviation Ltd
International Aeradio Ltd

AIRLINE CATERING—See Catering

AIRSCREWS—See Propellers

ALLOYS, FERROUS
Aircraft Materials Ltd
Brown Bayley Steels Ltd
Brown Bros (Metals) Ltd
Firth & John Brown Ltd, Thos.
Flather Ltd, W. T.
Fox & Co Ltd, Samuel
Jessop-Saville Ltd
Kayser, Ellison & Co Ltd
Kiveton Park Steel & Wire Works Ltd
Low Moor Alloy Steelworks Ltd
Macready's Metal Co Ltd
Rapp Ltd, Leo
Salford Electrical Instruments Ltd
Telcon Metals Ltd
United Steel Companies Ltd, The

ALLOYS, FUSIBLE
Mining & Chemical Products Ltd

ALLOYS, HEAT-RESISTANT
Brown Bayley Steels Ltd
Firth-Vickers Stainless Steels Ltd
Fox & Co Ltd, Samuel
Imperial Chemical Industries Ltd
Jessop-Saville Ltd
Low Moor Alloy Steelworks Ltd
Macready's Metal Co Ltd
Telcon Metals Ltd
United Steel Companies Ltd, The
Wiggin & Co Ltd, Henry
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

ALLOYS, HEAVY
General Electric Co Ltd, The
Low Moor Alloy Steelworks Ltd
Macready's Metal Co Ltd
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

ALLOYS, LIGHT
Aircraft Materials Ltd
Birmetals Ltd
Booth Aluminium Ltd, James
British Aluminium Co Ltd, The
High Duty Alloys Ltd
Imperial Aluminium Co Ltd
Kaye Ltd, E. & E.
Macready's Metal Co Ltd
Mills Ltd, William
Rapp Ltd, Leo
Southern Forge Ltd
Stone & Co (Charlton) Ltd, J.
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

ALTERNATORS
Bosch Ltd
de Havilland Aircraft Co Ltd, The
English Electric Co Ltd, The
General Electric Co Ltd, The
Hobson Ltd, H. M.
Newton Bros (Derby) Ltd
Petbow Ltd (Liverpool Works)
Plessey Co Ltd, The

ALUMINIUM
Alcan Industries Ltd
Aluminium Corporation Ltd
Attewell & Sons Ltd, B.
Booth Aluminium Ltd, James
British Aluminium Co Ltd, The
British Insulated Callender's Cables Ltd
Imperial Aluminium Co Ltd
Kaye Ltd, E. & E.
Mills Ltd, William
Rapp Ltd, Leo
Rollet & Co Ltd, H.
Southern Forge Ltd
Stone & Co (Charlton) Ltd, J.
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

ANODIZING
Bristol Aircraft Ltd
de Havilland Aircraft Co Ltd, The
Fairey Marine Ltd
Light-Metal Forgings Ltd
Metachemical Processes Ltd
Portsmouth Aviation Ltd
Reid & Sigrist Ltd
Scottish Aviation Ltd
Stuart (London) Ltd, Robert
Taylor (Metal Workers) Ltd, C. F.
Technical Platings Ltd

ARMAMENT (GUNS) AND COMPONENTS
Bristol Aircraft Ltd
British Manufacture & Research Co Ltd
Dunlop Rubber Co Ltd
French & Sons Ltd, Thomas
M.L. Aviation Co Ltd
R.F.D. Co Ltd
Taylor (Metal Workers) Ltd, C. F.

ARMAMENT (OTHER THAN GUNS) AND COMPONENTS
(see also Guided-weapon equipment)
Astralux Ltd
Boulton Paul Aircraft Ltd
Dunlop Rubber Co Ltd
French & Sons Ltd, Thomas
Hymatic Engineering Co Ltd, The
M.B. Metals Ltd
M.L. Aviation Co Ltd
Portsmouth Aviation Ltd
R.F.D. Co Ltd
Taylor (Metal Workers) Ltd, C. F.

ASBESTOS AND ASBESTOS COMPONENTS
(See also Refractory materials)
Bell's Asbestos & Engineering Co Ltd
Coin Insulation Ltd
Miles Marine & Structural Plastics Ltd
Taylor (Plastics) Ltd, C. F.
Turner Bros Asbestos Co Ltd

ASSEMBLIES, MAJOR AIRFRAME
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Aviation Traders (Engineering) Ltd
Boulton Paul Aircraft Ltd
Blackburn Electronics Ltd
Bristol Aircraft Ltd
Brooklands Aviation Ltd
Chinn & Co Ltd, J. S.
English Electric Aviation Ltd (Aircraft Division)
English Electric Aviation Ltd (Guided Weapons Division)
English Electric Co Ltd, The
Gloster Aircraft Co Ltd
Handley Page Ltd
Heston Aircraft & Associated Engineers Ltd
Portsmouth Aviation Ltd
Samlesbury Engineering Ltd
Scottish Aviation Ltd
Short Bros & Harland Ltd
Taylor (Metal Workers) Ltd, C. F.

ASSEMBLIES, SUB-
Abbey Panel & Sheet Metal Co Ltd
Aero Controls Ltd
Aircraft Materials Ltd
Airtech Ltd
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Aviation Traders (Engineering) Ltd
Boulton Paul Aircraft Ltd
Bramah & Co Ltd, J. R.
Bristol Aircraft Ltd
Brooklands Aviation Ltd
Burgess & Co Ltd, G. N.
CJC Developments (Portsmouth) Ltd
Chinn & Co Ltd, J. S.
Cornercroft Ltd
English Electric Aviation Ltd (Guided Weapons Division)
Fairey Marine Ltd
Gloster Aircraft Co Ltd
Grundy & Partners Ltd
Handley Page Ltd
Henderson Safety Tank Co Ltd
Henshall & Sons (Addlestone) Ltd, W.
Heston Aircraft & Associated Engineers Ltd
Hickman Ltd
Lancefield Aircraft Components Ltd
Leytonstone Jig & Tool Co Ltd
M.L. Aviation Co Ltd
Mallinson & Sons Ltd, William
Morfax Ltd
Plessey Co Ltd, The
R.F.D. Co Ltd
Reynolds Tube Co Ltd
Rollason Aerocessories Ltd
Rubery Owen & Co Ltd
Samlesbury Engineering Ltd
Saro (Anglesey) Ltd
Saywell Ltd, R. F.
Scottish Aviation Ltd
Short Bros & Harland Ltd
Taylor (Metal Workers) Ltd, C. F.

AUTOMATIC PILOTS
Elliott Bros (London) Ltd
Honeywell Controls Ltd
M.L. Aviation Co Ltd
Newmark Ltd, Louis
Smiths Aviation Division
Sperry Gyroscope Co Ltd

AUTOMATION UNITS (MACHINE TOOL, ETC)
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Armstrong Whitworth Equipment
Cossor Radar & Electronics Ltd
EMI Electronics Ltd
Ekco Electronics Ltd
Leytonstone Jig & Tool Co Ltd
Mullard Equipment Ltd
Sperry Gyroscope Co Ltd
Villiers (Tool Developments) Ltd

AUXILIARY POWER UNITS
Auto Diesels Ltd
Blackburn Engines Ltd
de Havilland Engine Co Ltd, The
Houchin Ltd
Petbow Ltd
Plessey Co Ltd, The
Rotax Ltd
Rover Gas Turbines Ltd

BAGS, COTTON, ETC, FOR SMALL PARTS
Feltham & Son Ltd, Walter H.
Mayday Equipment Ltd

BAGS, LIFTING, AIRCRAFT
Beaufort (Air Sea) Equipment Ltd
Dunlop Rubber Co Ltd
Lancefield Aircraft Components Ltd
Lea Bridge Industries Ltd
Mayday Equipment Ltd
R.F.D. Co Ltd

BALLOONS, METEOROLOGICAL AND RESEARCH
Lea Bridge Industries Ltd
Mayday Equipment Ltd

BALLOONS, TRAINING
Lea Bridge Industries Ltd
M.L. Aviation Co Ltd
Mayday Equipment Ltd
R.F.D. Co Ltd

BARRIER CREAMS
Docker Bros
Imperial Chemical Industries Ltd
Rozalex Ltd

BATTERIES
AEI Radio & Electronic Components Division
Bosch Ltd
Burndept Ltd
Cadmium Nickel Batteries Ltd
Chloride Batteries Ltd
General Electric Co Ltd, The
Lucas Ltd, Joseph
Metachemical Processes Ltd
Oldham & Son Ltd
Peto & Radford
Pritchett & Gold and E.P.S. Co Ltd
Rotax Ltd
Varley Dry Accumulators Ltd
Venner Accumulators Ltd

BEARINGS, BALL
Autoset (Production) Ltd
B.M.B. (Sales) Ltd
Brooklands Aviation Ltd
E.M.O. Instrumentation Ltd
Fafnir Bearing Co Ltd
Hoffmann Manufacturing Co Ltd
Ransome & Marles Bearing Co Ltd
Rose Bros (Gainsborough) Ltd
Skefko Ball Bearing Co Ltd, The

BEARINGS, ROLLER
British Timken Division of the Timken Roller Bearing Co
Fafnir Bearing Co Ltd
Hoffmann Manufacturing Co Ltd
Ransome & Marles Bearing Co Ltd
Salter & Co Ltd, Geo
Skefko Ball Bearing Co Ltd, The
Torrington Co Ltd, The

BEARINGS (other than ball and roller)
Aero Controls Ltd
B.M.B. (Sales) Ltd

[*Continued on page 332*

Sea Vixen with two Microcell retractable glass-fibre launchers, each housing 14 2in rockets. The aircraft can carry four more, each loaded with 24 rockets, so that it can fire a 124-missile salvo

Miniature ball bearings by B.M.B. (Sales) Ltd

ANCILLARY INDUSTRY 1961...

Birkett, Billington & Newton Ltd, T. M.
British Timken Division of the Timken Roller Bearing Co
Coin Insulation Ltd
Macready's Metal Co Ltd
R.F.D. Co Ltd
R.M.R. Engineering
Silentbloc Ltd
Tufnol Ltd
Vandervell Products Ltd
Yorkshire Engineering Supplies Ltd

BELTS, DRIVING

Bell's Asbestos & Engineering Ltd
Turner Bros Asbestos Co Ltd

BELTS, PASSENGER SEAT

Aerolex Ltd
G.Q. Parachute Co Ltd
Lancefield Aircraft Components Ltd
Rumbold & Co Ltd, L. A.
Siebe, Gorman & Co Ltd

BLADES, GAS TURBINE

Firth-Derihon Stampings Ltd, The
Hadfields Ltd
Hepworth & Grandage (Yeadon) Ltd
High Duty Alloys Ltd
Jessop-Saville Ltd
Light-Metal Forgings Ltd
Precision Forgings Ltd

BOLTS—See A.G.S. parts

BOLTS, LEAKPROOF

Dowty Seals Ltd
Guest Keen & Nettlefolds (Midlands) Ltd
Kane (Sealants) Ltd, Douglas
Villiers (Tool Developments) Ltd

BONDED RUBBER—See Rubber

BONDING, RESIN

Bakelite Ltd
CIBA (A.R.L.) Ltd
Imperial Chemical Industries Ltd
Kane (Sealants) Ltd, Douglas
Kenilworth Manufacturing Co Ltd, The
Mallinson & Sons Ltd, William
Miles Marine & Structural Plastics Ltd

BOWSERS (WATER DE-ICING, ETC)

Edghill Equipment Ltd
Rellumit (London) Ltd
Taylor (Metal Workers) Ltd, C. F.
Thompson Bros (Bilston) Ltd
Truro Engine Works Ltd

BRAKES, AIRCRAFT, AND COMPONENTS
(See also Tyres and wheels)

Dunlop Rubber Co Ltd
Electro-Hydraulics Ltd
Goodyear Tyre & Rubber Co (Great Britain) Ltd
Lockheed Precision Products Ltd
Palmer Aero Products Ltd

BRASS

Birkett, Billington & Newton Ltd, T. M.
British Insulated Callender's Cables Ltd
Imperial Chemical Industries Ltd
Rapp Ltd, Leo
Rollet & Co Ltd, H.
Villiers (Tool Developments) Ltd
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

BRONZE

Birkett, Billington & Newton Ltd, T. M.
British Insulated Callender's Cables Ltd
Rapp Ltd, Leo
Rollet & Co Ltd, H.
Stone & Co (Charlton) Ltd, J.
Villiers (Tool Developments) Ltd
Yorkshire Engineering Supplies Ltd

BUILDINGS, AIRFIELD AND FACTORY

Costain Ltd, Richard
Douglas (Contractors) Ltd, Robert M.
Scotney Ltd, Tom M.
United Steel Companies Ltd, The

CABLES, CONTROL, AND ACCESSORIES

Aircraft Materials Ltd
British Insulated Callender's Cables Ltd
British Ropes Ltd
Dunlop Rubber Co Ltd
Fothergill & Harvey Ltd
Grundy & Partners Ltd
Hellermann Ltd
Plessey Co Ltd, The
Teleflex Products Ltd

CABLES, ELECTRICAL

Amphenol-Borg Ltd
Associated Electrical Industries Ltd
British Insulated Callender's Cables Ltd
General Electric Co Ltd, The
Grundy & Partners Ltd
Rist's Wires & Cables Ltd
Rotax Ltd
Standard Telephones & Cables Ltd
Whittemore (Aeradio) Ltd, A. J.

CALIBRATION EQUIPMENT

Bryans Aeroquipment Ltd
de Havilland Aircraft Co Ltd, The
I.V. Pressure Controllers Ltd
Munro Ltd, R. W.
Racal Engineering Ltd
Taylor, Taylor & Hobson
Wilmot Mansour Ltd

CAMERAS, AERIAL

Direct Photographic Supplies Ltd
Fairey Air Surveys Ltd
Harringay Photographic & Electrical Supplies Ltd
Specto Ltd
Vinten Ltd, W.
Williamson Manufacturing Co Ltd

CAMERAS, FILM

Direct Photographic Supplies Ltd
Fairey Air Surveys Ltd
Harringay Photographic & Electrical Supplies Ltd
Ilford Ltd
Kodak Ltd
Reid & Sigrist Ltd
Vinten Ltd, W.

CAMERAS, RESEARCH

Fairey Air Surveys Ltd
Harringay Photographic & Electrical Supplies Ltd
Langham Thompson Ltd, J.
Southern Instruments Ltd
Vinten Ltd, W.

CANOPIES, COCKPIT
(See also Plastics)

Armstrong Whitworth Aircraft Ltd, Sir W.G.
Bristol Aircraft Ltd
Gloster Aircraft Co Ltd
Samlesbury Engineering Ltd
Suntex Safety Glass Industries Ltd
Thermo-Plastics Ltd

CANOPY ACTUATION AND JETTISON EQUIPMENT

Bristol Aircraft Ltd
Hymatic Engineering Co Ltd, The
M.L. Aviation Co Ltd
Teddington Aircraft Controls Ltd
Teleflex Products Ltd

CAPACITORS

Associated Electrical Industries Ltd (Motor & Control Gear Division)
Bosch Ltd
British Insulated Callender's Cables Ltd
C.W.C. Equipment Ltd
General Electric Co Ltd, The
Muirhead & Co Ltd
Mullard Ltd
Plessey Co Ltd, The
Standard Telephones & Cables Ltd
Texas Instruments Ltd

CAPSULES, PRESSURE RESPONSIVE

Appleby & Ireland Ltd
Mechanism Ltd
Munro Ltd, R. W.
Negretti & Zambra Ltd
Power Flexible Tubing Co Ltd
Teddington Aircraft Controls Ltd

CARAVANS

Jablo Propellers Ltd
Lea Bridge Industries Ltd
Samlesbury Engineering Ltd

CARBURATION EQUIPMENT

Hobson Ltd, H. M.
R.M.R. Engineering

CASES AND CABINETS, INSTRUMENTS, ETC

Bristol Aircraft Ltd
C & N (Electrical) Ltd
Gloster Aircraft Co Ltd
Grundy & Partners Ltd
Hickman Ltd
Imhof Ltd, Alfred
Jablo Propellers Ltd
Middleton Sheet Metal Co Ltd
Morfax Ltd
Plessey Co Ltd, The
Redwing Ltd
Reynolds (Packaging) Ltd
Scotney Ltd, Tom M.
Taylor (Plastics) Ltd, C. F.
Thermo-Plastics Ltd

CASTINGS, LIGHT ALLOY

Aircraft Materials Ltd
Alcan Industries Ltd
Armytage Bros (Knottingley) Ltd
Birkett, Billington & Newton Ltd, T. M.
Birmingham Aluminium Casting (1903) Co Ltd
Brockhouse & Co Ltd, J.
High Duty Alloys Ltd
Kent Alloys Ltd
Magnesium Elektron Ltd
Mastermodels Ltd
Mills Ltd, William
Sparklets Products (British Oxygen Co Ltd)
Sterling Metals Ltd
Stone & Co (Charlton) Ltd, J.
Telcon Metals Ltd
Trucast Ltd
Villiers (Tool Developments) Ltd
Wellworthy Ltd
Wilson & Sons (London) Ltd, W.

CASTINGS, STEEL

Brockhouse & Co Ltd, J.
Distington Engineering Co Ltd
English Electric Co Ltd, The
English Steel Castings Corporation Ltd
Firth & John Brown Ltd, Thos.
Firth-Vickers Stainless Steels Ltd
Hadfields Ltd
Jessop-Saville Ltd

[*Continued opposite*

Turbine blades by Hepworth & Grandage Ltd

"Windak" full-pressure helmet and suit by Baxter, Woodhouse & Taylor Ltd

Macready's Metal Co Ltd
Napier & Son Ltd, D.
Telcon Metals Ltd
Trucast Ltd
United Steel Companies Ltd, The
Wilson Alloys Ltd

CASTINGS, OTHER THAN ABOVE

Armytage Bros (Knottingley) Ltd
Birkett, Billington & Newton Ltd, T. M.
Brockhouse & Co Ltd, J.
Coin Insulation Ltd
Distington Engineering Co Ltd
English Electric Co Ltd, The
Ferranti Ltd
Firth & John Brown Ltd, Thos.
Kent Alloys Ltd
Mastermodels Ltd
Napier & Son Ltd, D.
Salter & Co Ltd, Geo.
Stone & Co (Charlton) Ltd, J.
Telcon Metals Ltd
Trucast Ltd
United Steel Companies Ltd, The
Villiers (Tool Developments) Ltd
Whiteley Electrical Radio Co Ltd
Yorkshire Engineering Supplies Ltd

CATERING EQUIPMENT

Aerogalley Ltd
Attewell & Sons Ltd, B.
Gloster Aircraft Co Ltd
Henshall & Sons (Addlestone) Ltd, W.

CASTORS

Autoset (Production) Ltd
Flexello Castors & Wheels Ltd

CATERING EQUIPMENT, AIRLINER

Aerogalley Ltd
Aircraft Materials Ltd
Attewell & Sons Ltd, B.
General Electric Co Ltd, The
Henshall & Sons (Addlestone) Ltd, W.
Hickman Ltd
Jablo Propellers Ltd
Mallinson & Sons Ltd, William
Redwing Ltd
Samlesbury Engineering Ltd
Sparklets Products (British Oxygen Co Ltd)
Taylor (Metal Workers) Ltd, C. F.
Taylor (Plastics) Ltd, C. F.

CATERING SERVICES, AIRLINE, ETC

Derby Aviation Ltd

CERAMICS AND CERAMIC COATINGS

Brush Crystal Co Ltd
Lodge Plugs Ltd
Plessey Co Ltd, The
Steatite & Porcelain Products Ltd

CHAIN, DRIVING

Renold Chains Ltd

CHEMICALS, INDUSTRIAL

Brent Chemical Products Ltd
British Oxygen Aviation Services
Imperial Chemical Industries Ltd
Kane (Sealants) Ltd, Douglas
Laporte Chemicals Ltd
Metachemical Processes Ltd
Monsanto Chemicals Ltd
United Coke & Chemicals Co Ltd
United Steel Companies Ltd, The

CLAMPS, MACHINE-TOOL AND SPECIAL PURPOSE

C.W.C. Equipment Ltd
Hydraulics & Pneumatics Ltd
King Aircraft Corporation
Leytonstone Jig & Tool Co Ltd
Samlesbury Engineering Ltd
Villiers (Tool Developments) Ltd

CLEANING MATERIALS AND EQUIPMENT

Aerogalley Ltd
Brent Chemical Products Ltd
Mullard Equipment Ltd
Valay Industries Ltd

CLIPS

Aircraft Materials Ltd
Bell's Asbestos & Engineering Ltd
Bristol Aircraft Ltd
Brown Bros (Aircraft) Ltd
Dunlop Rubber Co Ltd
R.F.D. Co Ltd
Ross, Courtney & Co Ltd
Salter & Co Ltd, Geo.
Terry & Sons Ltd, Herbert

CLOCKS

Graseby Instruments Ltd

Comet control pedestal: a 4½lb sand casting in magnesium alloy by Sterling Metals Ltd

CLOTH, UPHOLSTERY

Baxter, Woodhouse & Taylor Ltd
Cox & Son Ltd, John
Fothergill & Harvey Ltd
Latex Upholstery Ltd
Williamson & Son Ltd, Jas

CLOTHING, FLYING

Baxter, Woodhouse & Taylor Ltd
Beaufort (Air Sea) Equipment Ltd
Frankenstein & Sons (Manchester) Ltd, P.
G.Q. Parachute Co Ltd
Industrial Leather Products Ltd
Lea Bridge Industries Ltd
Lewis Ltd, D.
M.L. Aviation Co Ltd
Mayday Equipment Ltd
Siebe, Gorman & Co Ltd

CLOTHING, INDUSTRIAL AND PROTECTIVE

Anticoustic Co, The
Beaufort (Air Sea) Equipment Ltd
Bell's Asbestos & Engineering Ltd
Frankenstein & Sons (Manchester) Ltd, P.
G.Q. Parachute Co Ltd
I.C.I. (Hyde) Ltd
Industrial Leather Products Ltd
Lea Bridge Industries Ltd
Siebe, Gorman & Co Ltd

CLOTHING, UNIFORM

Fishers
Lea Bridge Industries Ltd

CLUTCHES

Carter & Co Ltd, B. & F.
Lockheed Precision Products Ltd
Renold Chains Ltd

COLD-ROLLED SECTIONS (see also Alloys)

Boulton Paul Aircraft Ltd
British Aluminium Co Ltd, The
Brockhouse & Co Ltd, J.
Equator Wheels & Sections Ltd
Kiveton Park Steel & Wire Works Ltd
Low Moor Alloy Steelworks Ltd
Macready's Metal Co Ltd
Middleton Sheet Metal Co Ltd
Rollet & Co Ltd, H.
Sankey & Sons Ltd, Joseph
United Steel Companies Ltd, The

COMMUNICATION SYSTEMS, AIRCRAFT INTERIOR

Airmed Ltd
Amplivox Ltd
British Communications Corporation Ltd
Elliott Bros (London) Ltd
Ericsson Telephones Ltd
Murphy Radio Ltd
Redifon Ltd
Standard Telephones & Cables Ltd
Ultra Electronics Ltd
Whittemore (Aeradio) Ltd, A. J.

COMPONENTS, AIRFRAME (See also Assemblies, major airframe)

Aircraft Materials Ltd
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Aviation Traders (Engineering) Ltd
Boulton Paul Aircraft Ltd
Bristol Aircraft Ltd
British Oxygen Aviation Services
Brooklands Aviation Ltd
Burgess & Co Ltd, G. N.
CJC Developments (Portsmouth) Ltd
Chinn & Co Ltd, J. S.
Cramic Aircraft Components Ltd
Dowty Rotol Ltd
English Electric Aviation Ltd (Aircraft Division)
English Electric Aviation Ltd (Guided Weapons Division)
Gloster Aircraft Co Ltd
Henshall & Sons (Addlestone) Ltd, W.
Heston Aircraft & Associated Engineers Ltd
Jablo Propellers Ltd
Lancefield Aircraft Components Ltd
Leytonstone Jig & Tool Co Ltd
Mallinson & Sons Ltd, William
Middleton Sheet Metal Co Ltd
Morfax Ltd
R.M.R. Engineering
Redwing Ltd
Rollason Aerocessories Ltd
Samlesbury Engineering Ltd
Saywell Ltd, R. F.
Scottish Aviation Ltd
Taylor (Metal Workers) Ltd, C. F.
Western Manufacturing (Reading) Ltd

COMPONENTS AND DETAILS, ELECTRICAL

Associated Electrical Industries Ltd (Motor & Control Gear Division)
Astralux Ltd
Avimo Ltd
Belling & Lee Ltd
Bristol Aircraft Ltd
Brooklands Aviation Ltd
Brown Bros (Aircraft) Ltd
C.W.C. Equipment Ltd
Carr Fastener Co Ltd
de Havilland Aircraft Co Ltd
Dowty Electrics Ltd
Dunlop Rubber Co Ltd
Eastern Aero Electrical Services Ltd
English Electric Co Ltd The
Ericsson Telephones Ltd
Ferranti Ltd
General Electric Co Ltd, The
Leytonstone Jig & Tool Co Ltd
M. B. Metals Ltd
M. L. Aviation Co Ltd
Miles Engineering Ltd, F. G.
Newmark Ltd, Louis
Newton Bros (Derby) Ltd
Page Engineering Co (Sunbury on Thames) Ltd
Plessey Co Ltd, The
Portsmouth Aviation Ltd
R. F. D. Co Ltd
Redwing Ltd
Rotax Ltd
Samlesbury Engineering Ltd
Sheffield Smelting Co Ltd, The
Somers Ltd, J. N.
Standard Telephones & Cables Ltd
Teddington Aircraft Controls Ltd
Telcon Metals Ltd
Thorn Electrical Industries Ltd
Vandyke Engineering Ltd
Vosper Ltd
Ward, Brooke & Co Ltd
Western Manufacturing (Reading) Ltd
Westinghouse Brake & Signal Co Ltd
Whiteley Electrical Radio Co Ltd
Whittemore (Aeradio) Ltd, A. J.

COMPONENTS AND DETAILS, ELECTRONIC

AEI Radio & Electronic Components Division
Aero Electronics Ltd
Airmed Ltd
Amphenol-Borg Ltd
Anticoustic Co, The
Armstrong Whitworth Aircraft Ltd, Sir W. G.

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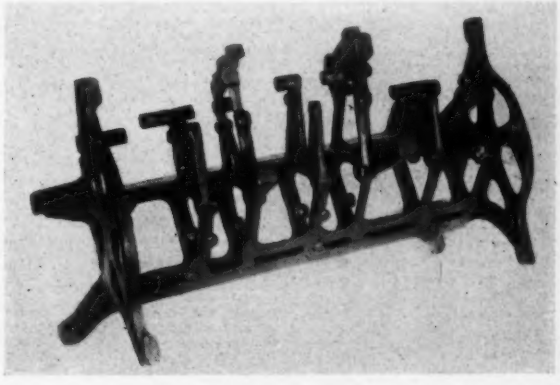


ANCILLARY INDUSTRY 1961...

Associated Electrical Industries Ltd
Associated Electrical Industries (Motor & Control Gear Division)
Astralux Ltd
B & M Electronics Ltd
Belling & Lee Ltd
Beme Telecommunications Ltd
Bradley Ltd, G. & E.
Bristol Aircraft Ltd
Brush Crystal Co Ltd
C. W. C. Equipment Ltd
Carr Fastener Co Ltd
Chinn & Co Ltd, J. S.
de Havilland Aircraft Co Ltd, The
EMI Electronics Ltd
Ekco Electronics Ltd
English Electric Aviation Ltd (Guided Weapons Division)
Ferranti Ltd
General Electric Co Ltd, The
Girdlestone Pumps Ltd
Lancefield Aircraft Components Ltd
Leytonstone Jig & Tool Co Ltd
M. B. Metals Ltd
M. L. Aviation Co Ltd
Miles Electronics Ltd
Miles Engineering Ltd, F. G.
Muirhead & Co Ltd
Mullard Ltd
Newmark Ltd, Louis
Page Engineering (Sunbury on Thames) Ltd
Plessey Co Ltd, The
Portsmouth Aviation Ltd
R.F.D. Co Ltd
Royston Instruments Ltd
Salford Electrical Instruments Ltd
Sanders (Electronics) Ltd, W. H.
Sciaky Electric Welding Machines Ltd
Sheffield Smelting Co. Ltd, The
Somers Ltd, J. N.
Sperry Gyroscope Co Ltd
Standard Telephones & Cables Ltd
Teddington Aircraft Controls Ltd
Telcon Metals Ltd
Texas Instruments Ltd
Thorn Electrical Industries Ltd
Vactric Control Equipment Ltd
Vandyke Engineering Ltd
Venner Electronics Ltd
Western Manufacturing (Reading) Ltd
Westinghouse Brake & Signal Co Ltd
Whiteley Electrical Radio Co Ltd
Whittemore (Aeradio) Ltd., A. J.

COMPONENTS, GAS-TURBINE SHEET METAL

Aviation Traders (Engineering) Ltd
Bramah & Co Ltd, J. R.
Burnley Aircraft Products Ltd
Chinn & Co Ltd, J. S.
Cornercroft Ltd
Delaney Gallay Ltd
Equator Wheels & Sections Ltd
Heston Aircraft & Associated Engineers Ltd
Leytonstone Jig & Tool Co Ltd
Lucas Gas Turbine Equipment Ltd
Middleton Sheet Metal Co Ltd
Morfax Ltd
R.F.D. Co Ltd
Samlesbury Engineering Ltd
Sankey & Sons Ltd, Joseph
Smith Ltd, Herman
Taylor (Metal Workers) Ltd, C. F.
V.P. Sheet Metal Ltd
Vandyke Engineering Ltd
Wilmot Breeden Ltd

COMPRESSORS, INDUSTRIAL

Atlas Copco (Great Britain) Ltd
British Oxygen Aviation Services
Dunlop Rubber Co Ltd
Godfrey & Partners Ltd, Sir George
Hydraulics & Pneumatics Ltd
Hymatic Engineering Co Ltd, The
Rover Gas Turbines Ltd
Siebe, Gorman & Co Ltd
Villiers (Tool Developments) Ltd
Williams & James (Engineers) Ltd

COMPUTERS AND EQUIPMENT—

See Data-processing equipment

CONNECTORS, ELECTRICAL

Aircraft-Marine Products (G.B.) Ltd
Airtech Ltd
Amphenol-Borg Ltd
Belling & Lee Ltd
Bristol Aircraft Ltd
British Insulated Callender's Cables Ltd
Burndept Ltd
C.W.C. Equipment Ltd
Carr Fastener Co Ltd
General Electric Co. Ltd, The
Girdlestone Pumps Ltd
Grundy & Partners Ltd
Hellermann Ltd
M.B. Metals Ltd
M.L. Aviation Co Ltd
Plessey Co Ltd, The
Rotax Ltd
Smart & Brown (M.T.) Ltd
Smiths Aviation Division
Thorn Electrical Industries Ltd
W.S. Electronics Ltd
Ward, Brooke & Co Ltd
Whiteley Electrical Radio Co Ltd
Whittemore (Aeradio) Ltd, A. J.

CONNECTORS, HOSE

Aircraft Materials Ltd
Airtech Ltd
Bell's Asbestos & Engineering Ltd
Bristol Aircraft Ltd
Exactor Ltd
Flight Refuelling Ltd
High Pressure Components Ltd
Hymatic Engineering Co Ltd, The
King Aircraft Corporation
Lockheed Precision Products Ltd
Palmer Aero Products Ltd
Power Auxiliaries Ltd
Power Flexible Tubing Co Ltd
R.M.R. Engineering
Robinson & Co (Gillingham) Ltd, L.
SPE Co Ltd
Teddington Aircraft Controls Ltd

CONSULTANT SERVICES

Avon India Ribber Co Ltd, The
Bailey-Watson & Associates Ltd
Belling & Lee Ltd
Cossor Radar & Electronics Ltd
Derby Avition Ltd
Fairey Air Surveys Ltd
Helicopter Sales Ltd
Hydraulics & Pneumatics Ltd
International Aeradio Ltd
Leytonstone Jig & Tool Co Ltd
Power Jets (Research & Development) Ltd
Samlesbury Engineering Ltd
Saywell Ltd, R. F.
Solus-Schall Ltd
Sutton (Consultants) Ltd, R. W.
Tiltman Langley Ltd
Universal Flying Services Ltd
Villiers (Tool Developments) Ltd
Wilmot Mansour Ltd

CONTROL EQUIPMENT, HELICOPTER

de Havilland Aircraft Co Ltd, The
Ferranti Ltd
Newmark Ltd, Louis
Sperry Gyroscope Co Ltd
Teddington Aircraft Controls Ltd

CONTROL EQUIPMENT, REMOTE

Armstrong Whitworth Aircraft Ltd, Sir W. G.
Armstrong Whitworth Equipment
Beme Telecommunications Ltd
Bloctube Controls Ltd
Boulton Paul Aircraft Ltd
Cossor Radar & Electronics Ltd
Dowty Flectrics Ltd
EMI Electronics Ltd
Electro-Hydraulics Ltd
Exactor Ltd
Fairey Engineering Ltd
Hobson Ltd, H. M.
Hydraulics & Pneumatics Ltd
Lockheed Precision Products Ltd
Mitchell Hydraulics Ltd
Negretti & Zambra Ltd
Plessey Co Ltd, The
Pullin & Co Ltd, R. B.
Sperry Gyroscope Co Ltd
Standard Telephones & Cables Ltd
Stone & Co (Deptford) Ltd, J.
Teleflex Products Ltd
Ultra Electronics Ltd

CONTROLS, AUTOMATIC (GOVERNORS, ETC)

Brown Ltd, S. G.
Hobson Ltd, H. M.
Iso-Speedic Co Ltd, The
Newmark Ltd, Louis
Pullin & Co Ltd, R. B.
Teddington Aircraft Controls Ltd
Ultra Electronics Ltd

CONTROLS, ENGINE

Bloctube Controls Ltd
Dunlop Rubber Co Ltd
Hobson Ltd, H. M.
Lucas Gas Turbine Equipment Ltd
Negretti & Zambra Ltd
Teddington Aircraft Controls Ltd
Teleflex Products Ltd
Ultra Electronics Ltd
Villiers (Tool Developments) Ltd

CONTROLS, FLYING

Aero Controls Ltd
Boulton Paul Aircraft Ltd
Bristol Aircraft Ltd
Burgess & Co Ltd, G. N.
Dowty Rotol Ltd
Electro-Hydraulics Ltd
Elliott Bros (London) Ltd
Hobson Ltd, H. M.
Lockheed Precision Products Ltd
Precision Forgings Ltd
Teleflex Products Ltd

CONTROLS, POWERED

Boulton Paul Aircraft Ltd
Bristol Aircraft Ltd
Electro-Hydraulics Ltd
Fairey Engineering Ltd
Hobson Ltd, H. M.
Lockheed Precision Products Ltd

COOLANTS

British Oxygen Aviation Services
Imperial Chemical Industries Ltd
Monsanto Chemicals Ltd

COPPER

Aircraft Materials Ltd
British Insulated Callender's Cables Ltd
Decca Radar Ltd
Imperial Chemical Industries Ltd
Kaye Ltd, E. & E.
Rapp Ltd, Leo
Rollet & Co Ltd, H.
Telcon Metals Ltd
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

CORROSION INHIBITORS AND EQUIPMENT

Brent Chemical Products Ltd
Esso Petroleum Co Ltd
Hellermann Ltd
Imperial Chemical Industries Ltd
Monsanto Chemicals Ltd
Skyhi Ltd
Valay Industries Ltd
Walterisation Co Ltd. The

COUNTING EQUIPMENT

Carter & Co Ltd, B. & F.
Cossor Radar & Electronics Ltd
Mullard Equipment Ltd
Parsons & Co Ltd. S.
Southern Instruments Ltd

COUPLINGS, FLEXIBLE

(See also Joints, universal)

Accles & Pollock Ltd
Aero Controls Ltd
Avimo Ltd
Avon India Rubber Co Ltd, The
Bell's Asbestos & Engineering Ltd
British Oxygen Aviation Services
Electro-Hydraulics Ltd
Flight Refuelling Ltd
Hardy Spicer Ltd
High Pressure Components Ltd
King Aircraft Corporation
Laycock Engineering Ltd
Leytonstone Jig & Tool Co Ltd
Peradin Rubber Co Ltd
Rellumit (London) Ltd
Renold Chains Ltd
Silentbloc Ltd
Teddington Aircraft Controls Ltd

COUPLINGS, SELF-SEALING

Aero Controls Ltd
Armstrong Whitworth Equipment
Avery-Hardoll Ltd
Avimo Ltd
Exactor Ltd
Flight Refuelling Ltd
High Pressure Components Ltd
Hymatic Engineering Co Ltd, The
King Aircraft Corporation
Lockheed Precision Products Ltd
Lucas Gas Turbine Equipment Ltd
Power Auxiliaries Ltd
Power Flexible Tubing Co Ltd
Precision Forgings Ltd
Rellumit (London) Ltd
Super Oil Seals & Gaskets Ltd
Teddington Aircraft Controls Ltd

COVERS, AIRCRAFT, ETC

Benson Aircraft Interior Furnishing Ltd, J.J.
Brard & Co Ltd, R. A.
Bristol Aircraft Ltd
I.C.I. (Hyde) Ltd
Lancefield Aifcraft Components Ltd
Latex Upholstery Ltd
Lea Bridge Industries Ltd
Mayday Equipment Ltd
R.F.D. CO Ltd

CRYSTALS, QUARTZ

Aero Electronics Ltd
Brush Crystal Co Ltd
Cathodeon Crystals Ltd
General Electric Co Ltd, The
Marconi's Wireless Telegraph Co Ltd
Salford Electrical Instruments Ltd
Standard Telephones & Cables Ltd

DAMPERS, CONTROL

Electro-Hydraulics Ltd
Girling Ltd

DATA-PROCESSING EQUIPMENT

AEI Instrumentation Division
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Associated Electrical Industries Ltd
Blackburn Electronics Ltd
Bryans Aeroquipment Ltd
de Havilland Aircraft Co Ltd, The
Decca Radar Ltd
Dobbie McInnes (Electronics) Ltd
EMI Electronics Ltd
Elliott Bros (London) Ltd
English Electric Aviation Ltd (Guided Weapons Division)
English Electric Co Ltd, The
Ericsson Telephones Ltd
Ferranti Ltd
General Precision Systems Ltd
Microcell Ltd
Miles Electronics Ltd
Mullard Equipment Ltd
Newmark Ltd, Louis
Redifon Ltd
Robinson & Partners Ltd, F. C.
Royston Instruments Ltd
Short Bros & Harland Ltd
Solartron Electronic Group Ltd, The
Sperry Gyroscope Co Ltd
Standard Telephones & Cables Ltd
Ultra Electronics Ltd
Westland Aircraft Ltd (Saunders-Roe Division)

DECARBONIZING PREPARATIONS AND EQUIPMENT

Brent Chemical Products Ltd
Laporte Chemicals Ltd

DEGREASING PREPARATIONS AND EQUIPMENT

Brent Chemical Products Ltd
Imperial Chemical Industries Ltd
Laporte Chemicals Ltd
Metachemical Processes Ltd
Mullard Equipment Ltd
Walterisation Co Ltd, The

DE-ICING AND ANTI-ICING EQUIPMENT AND FLUIDS, ETC

Aerocontacts (Aircraft Distributors) Ltd
Armstrong Whitworth Equipment
Baxter, Woodhouse & Taylor Ltd
Bell's Asbestos & Engineering Ltd
de Havilland Aircraft Co Ltd, The
Delaney Gallay Ltd
Dunlop Rubber Co Ltd
Flexible Ducting Ltd
Hunting Mhogias Ltd
Hymatic Engineering Co Ltd, The
Imperial Chemical Industries Ltd
Isopad Ltd
Kenilworth Manufacturing Co Ltd, The
Lucas Gas Turbine Equipment Ltd
Metachemical Processes Ltd
Napier & Son Ltd, D.
Normalair Ltd
Palmer Aero Products Ltd
Plessey Co Ltd, The
Rollason Aerocessories Ltd
Rotax Ltd
SPE Co Ltd
Serck Radiators Ltd
Simon Engineering Dudley Ltd
Stone & Co (Deptford) Ltd, J.
T.K.S. (Aircraft De-Icing) Ltd
Technograph Electronic Products Ltd
Teddington Aircraft Controls Ltd
Triplex Safety Glass Co Ltd

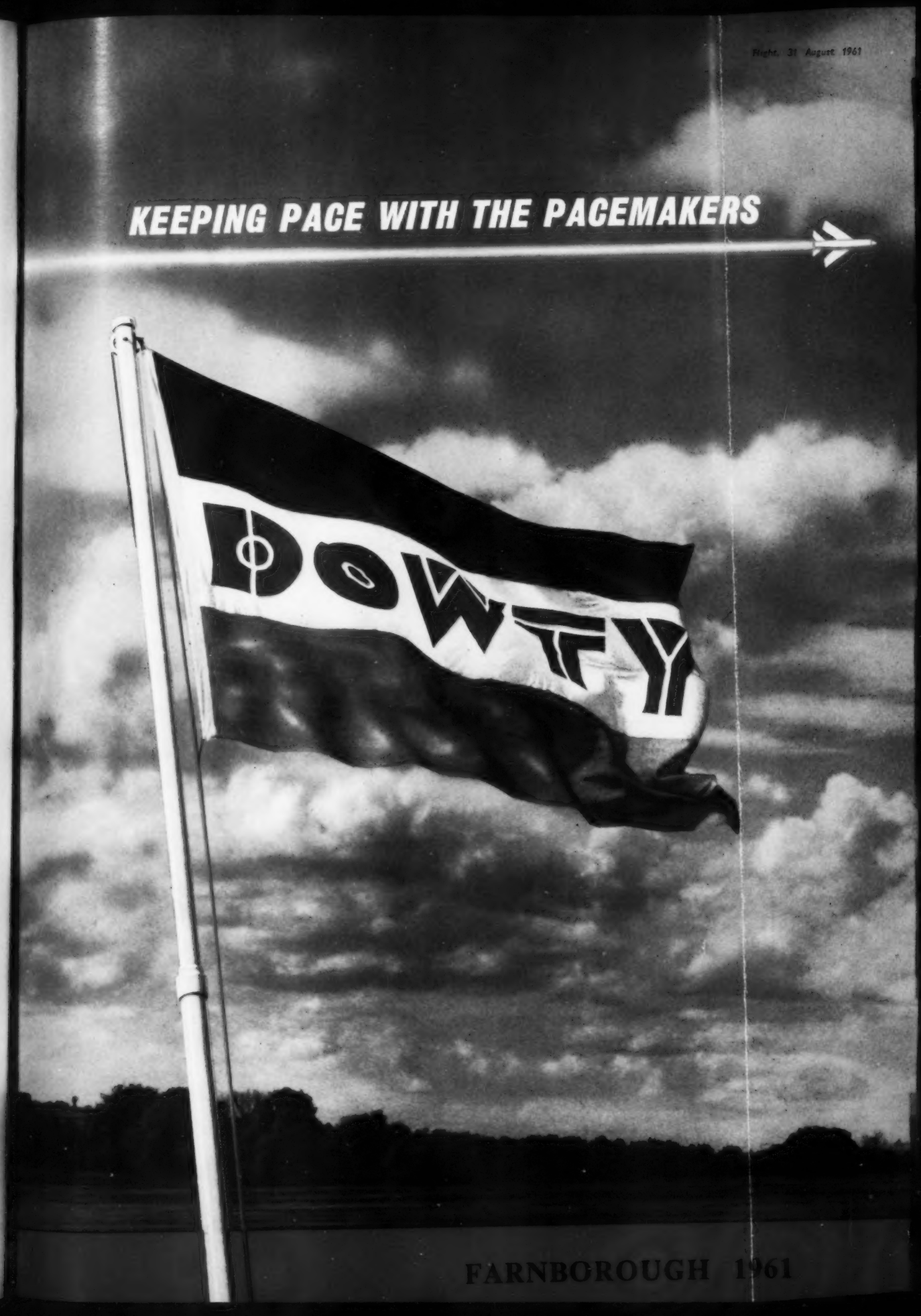
DEPOSITION, ELECTRO-

(including reclamation processes)

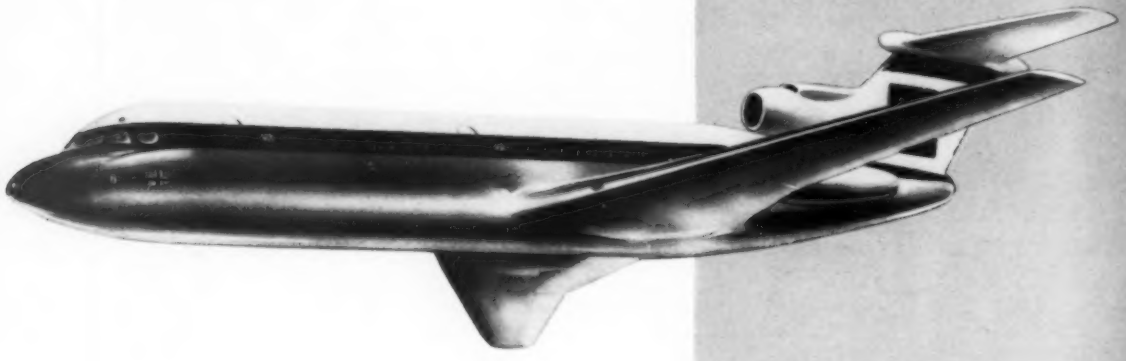
Atlas Plating Works Ltd
Cossor Radar & Electronics Ltd
Graseby Instruments Ltd
Hycrome Ltd
Metachemical Processes Ltd
Reid & Sigrist Ltd

[Continued on page 335

ADDRESSES OF COMPANIES: pages 349-355


KEEPING PACE WITH THE PACEMAKERS
DOWTY
FARNBOROUGH 1961

DOWTY side by side with



The de Havilland Trident uses Dowty Rotol ram air turbines and Dowty electrical components.

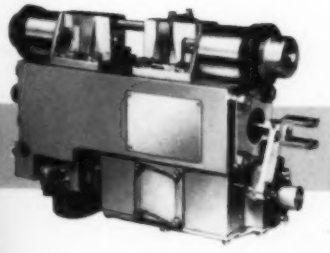
The Avro 748 is fitted with Dowty Rotol undercarriages, propellers, gearboxes and synchronizing equipment.

PROPELLERS · UNDERCARRIAGES · FUEL SYSTEMS

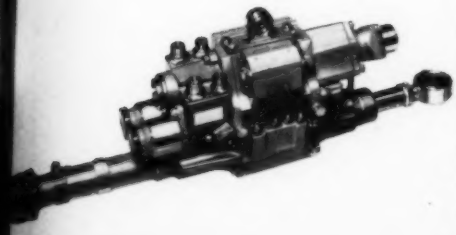
civil and

The Vickers VC10 uses Dowty Rotol ram air turbines.

Lightnings of No. 74 Squadron, R.A.F., rely on Dowty Rotol undercarriages and nosewheel steering, air turbines and hydraulic systems.

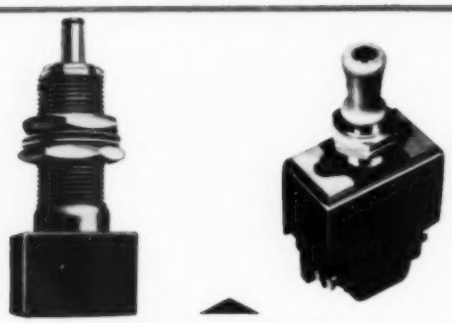


Dowty Rotol servo flying controls in use on British and overseas-built aircraft.

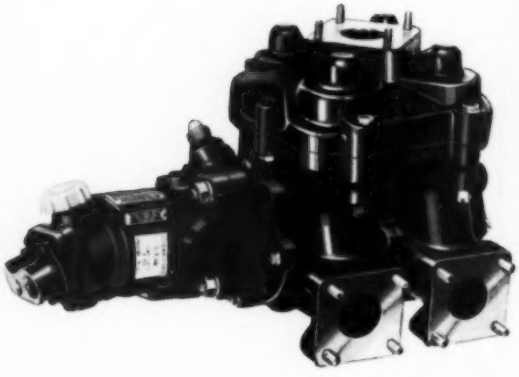


FUEL FLOW PROPORTIONERS · FLYING CONTROLS

military needs



New units from Dowty Electrics range—the hermetically sealed microswitch and a toggle switch. Most aircraft carry Dowty electrical components.



The Av
Britain'
with Do
and hyd

Dowty Rotol fuel flow proportioners have completed one million flying hours.

NATO'S strike fighter, the Fiat G91, flies with Dowty Rotol fuel flow proportioners.

TROLS

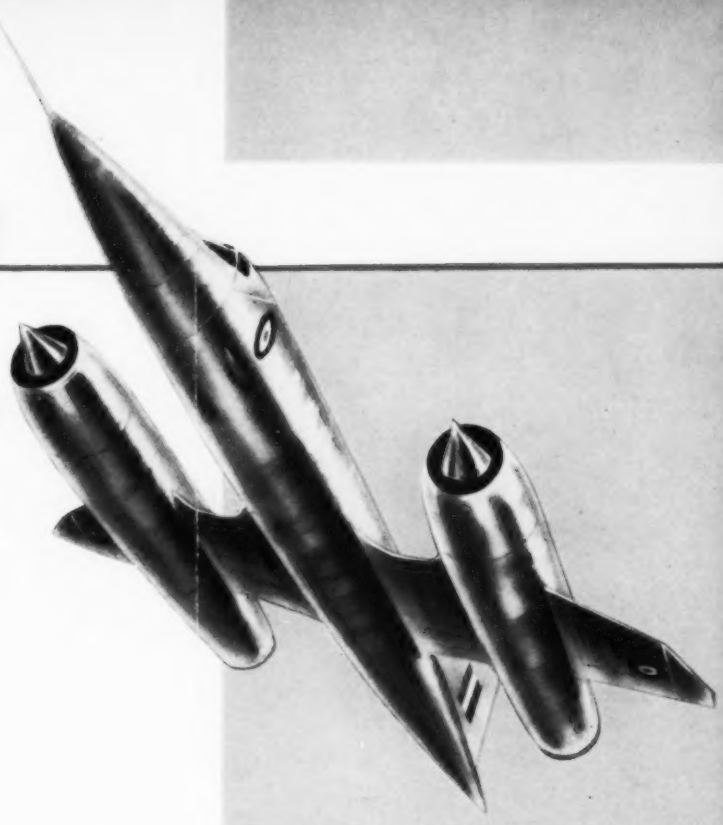
ELECTRICS · HYDRAULIC PU

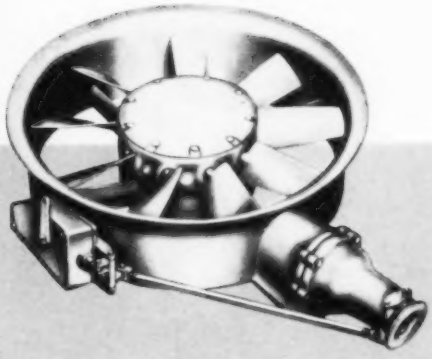
The Avro Vulcan, spearhead of Britain's V-bomber force, is fitted with Dowty Rotol undercarriages and hydraulic equipment.

LIC PUMPS AND JACKS

development

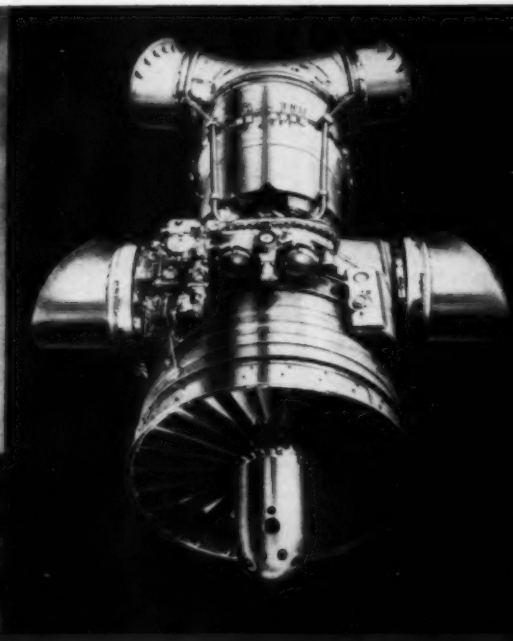
The Bristol B188, for supersonic research, uses Dowty fuel control systems, flying controls, undercarriage and high temperature hydraulics.





The Dowty Rotol Control Lift Fan for pitch and roll control on VTOL/STOL aircraft.

Britain's latest V.T.O.L. aircraft, the Hawker P1127, is fitted with Dowty Rotol undercarriages, steerable nosewheel unit, and hydraulic components. A Dowty fuel control system is part of the revolutionary Bristol BS53 engine which powers the aircraft.



CONTROL LIFT FANS · AIR TURBINES · SERVO VALVES

..and in the cargo field

The Armstrong Whitworth Argosy relies on Dowty undercarriages, propellers, gearboxes, hydraulics and electrics. (Main undercarriage on left.)

SEALS AND MOULDINGS

Dowty Seals and Mouldings are produced in a wide range of compounds to suit all requirements. They are approved for use with Skydrol, D.P.47, fuel, hydraulic and mineral oils.

A bulletin from Europe's largest manufacturer of aircraft equipment

DOWTY GROUP LIMITED · CHELTENHAM · ENGLAND

DOWTY ROTOL LIMITED : CHELTENHAM ROAD : GLOUCESTER
Telephone: Gloucester 24431

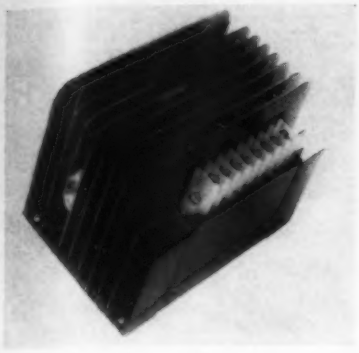
DOWTY FUEL SYSTEMS LIMITED : ARLE COURT : CHELTENHAM
Telephone: Cheltenham 53471

DOWTY ELECTRICS LIMITED : TEWKESBURY : GLOS.
Telephone: Tewkesbury 2383

DOWTY SEALS LIMITED : ASHCHURCH : GLOS.
Telephone: Tewkesbury 2271

BOULTON PAUL AIRCRAFT LIMITED : WOLVERHAMPTON
Telephone: Fordhouse 3191

DOWTY EQUIPMENT OF CANADA LIMITED : AJAX : ONTARIO
Telephone: Whitehall 23100



New three-phase static contactor by Rotax Ltd

ANCILLARY INDUSTRY 1961...

Standard Telephones & Cables Ltd
Stuart (London) Ltd, Robert
Technical Platings Ltd
Western Manufacturing (Reading) Ltd

DEPOSITION, OTHER
(including reclamation processes)

Albright & Wilson (Mfg) Ltd
Hycrome Ltd
Metachemical Processes Ltd
Standard Telephones & Cables Ltd

DESIGN AND EXPERIMENTAL WORK
(See also Drawing office services)

Abbey Panel & Sheet Metal Co Ltd
Aircraft Materials Ltd
Airwork Services Ltd
Appleby & Ireland Ltd
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Aviation Traders (Engineering) Ltd
Avimo Ltd
B & M Electronics Ltd
B.M.B. (Sales) Ltd
Beme Telecommunications Ltd
Boulton Paul Aircraft Ltd
Bristol Aircraft Ltd
British Oxygen Aviation Services
CJC Developments (Portsmouth) Ltd
Cementation (Muffelite) Ltd
Chinn & Co Ltd, J. S.
Cornercroft Ltd
Cossor Radar & Electronics Ltd
Cramic Aircraft Components Ltd
Cross Manufacturing Co (1938) Ltd
Cunard Eagle Airways Ltd
Curran Ltd, John
de Havilland Aircraft Co Ltd, The
Dunlop Rubber Co Ltd
E.P.S. (Research & Development) Ltd
Electro-Hydraulics Ltd
Electrocon Ltd
English Electric Aviation Ltd (Aircraft Division)
English Electric Aviation Ltd (Guided Weapons Division)
Fairey Air Surveys Ltd
General Precision Systems Ltd
Gloster Aircraft Co Ltd
Graseby Instruments Ltd
H.M.L. (Engineering) Ltd
Hendrey Relays Ltd
Heston Aircraft & Associated Engineers Ltd
Irving Air Chute of Great Britain Ltd
Leytonstone Jig & Tool Co Ltd
M.L. Aviation Co Ltd
Mechanism Ltd
Microcell Ltd
Miles Engineering Ltd, F. G.
Miles Hivolt Ltd
Miles Marine & Structural Plastics Ltd
Mitchell Hydraulics Ltd
Morfax Ltd
Munro Ltd, R. W.
Newmark Ltd, Louis
Page Engineering Co (Sunbury on Thames) Ltd
Plessey Co Ltd, The
Power Jets (Research & Development) Ltd
R.F.D. Co Ltd
Redwing Ltd
Reid & Sigrist Ltd
Samlesbury Engineering Ltd
Scotney Ltd, Tom M.
Scottish Aviation Ltd
Siebe, Gorman & Co Ltd
Skyways Ltd
Spa Guilds Ltd
Specto Ltd
Taylor (Metal Workers) Ltd, C. F.
Taylor (Plastics) Ltd, C. F.
Thompson (Engineers) Ltd, Raymond F.
Tiltman Langley Ltd
Trucast Ltd
V.P. Sheet Metal Ltd
Vactric Control Equipment Ltd
Villiers (Tool Developments) Ltd
Vosper Ltd
Western Manufacturing (Reading) Ltd
Whittemore (Aeradio) Ltd, A. J.
Wilmot Mansour Ltd

DIALS, INSTRUMENT

Aviation Traders (Engineering) Ltd
Reid & Sigrist Ltd
Thermo-Plastics Ltd

DIAMONDS AND DIAMOND TOOLS

Van Moppes & Sons (Diamond Tools) Ltd, L. M.

DIAPHRAGMS

Appleby & Ireland Ltd
Avon India Rubber Co Ltd, The
Bristol Aircraft Ltd
Hall & Hall Ltd
Marston Excelsior Ltd
Mechanism Ltd
Munro Ltd, R. W.
Negretti & Zambra Ltd
Normalair Ltd
Northern Rubber Co Ltd, The
Samlesbury Engineering Ltd
Telcon Metals Ltd
Trist & Co Ltd, Ronald

DINGHIES

Beaufort (Air Sea) Equipment Ltd
Cory Bros & Co Ltd (Survival Equipment Division)
Fairey Marine Ltd
Frankenstein & Sons (Manchester) Ltd, P.
Lea Bridge Industries Ltd
Mayday Equipment Ltd
Miles Marine & Structural Plastics Ltd
R.F.D. Co Ltd

DISCS, TURBINE

English Steel Forge & Engineering Corporation Ltd
Firth-Derihon Stampings Ltd, The
Hadfields Ltd
Jessop-Saville Ltd
Smith's Stamping Works (Coventry) Ltd
Vandyke Engineering Ltd

DOCKS, AIRCRAFT MAINTENANCE

Edghill Equipment Ltd
Mercury Airfield Equipment Ltd

DOORS, FOLDING, SLIDING, ETC
(See also Shutters)

Bolton Gate Co Ltd, The
Brockhouse & Co Ltd, J.
Esavian Ltd
Jablo Propellers Ltd

DOPPLER NAVIGATION AIDS

Decca Navigator Co Ltd
Decca Radar Ltd
Marconi's Wireless Telegraph Co Ltd

DRAWING OFFICE EQUIPMENT

Brown Ltd, S. G.
Dobbie McInnes (Electronics) Ltd
English Electric Aviation Ltd (Guided Weapons Division)
Harvey & Co (London) Ltd, G. A.
Pullin & Co Ltd, R. B.

DRAWING OFFICE SERVICES
(See also Design and experimental work)

Aero Controls Ltd
Aircraft Materials Ltd
Airwork Services Ltd
Aviation Traders (Engineering) Ltd
B & M Electronics Ltd
Beme Telecommunications Ltd
Boulton Paul Aircraft Ltd
Bristol Aircraft Ltd
C & N (Electrical) Ltd
Chinn & Co Ltd, J. S.
Cunard Eagle Airways Ltd
Curran Ltd, John
E.P.S. (Research & Development) Ltd
Fairey Air Surveys Ltd
Gloster Aircraft Co Ltd
Heston Aircraft & Associated Engineers Ltd
Leytonstone Jig & Tool Co Ltd
M. L. Aviation Co Ltd
Meridian Airmaps Ltd
Miles Engineering Ltd, F. G.
Miles Hivolt Ltd
Miles Marine & Structural Plastics Ltd
Mitchell Hydraulics Ltd
Page Engineering Co (Sunbury on Thames) Ltd
Portsmouth Aviation Ltd
R.F.D. Co Ltd
Scotney Ltd, Tom M.
Scottish Aviation Ltd
Skyways Ltd
Taylor (Metal Workers) Ltd, C. F.
Thompson (Engineers) Ltd, Raymond F.
Tiltman Langley Ltd
Villiers (Tool Developments) Ltd
Western Manufacturing (Reading) Ltd
Whittemore (Aeradio) Ltd, A. J.
Wilmot Mansour Ltd

EAR DEFENDERS

Amplivox Ltd
Anticoustic Co, The
Mallock-Armstrong Co, The
Siebe, Gorman & Co Ltd
Sutton (Consultants) Ltd, R. W.

ELECTRICAL EQUIPMENT, GENERAL
(See also under Components)

AEI Lamp & Lighting Co Ltd
Airtech Ltd
Associated Electrical Industries Ltd (Motor & Control Gear Division)
Belling & Lee Ltd
Bristol Aircraft Ltd
C & N (Electrical) Ltd
C.W.C. Equipment Ltd
Decca Radar Ltd
Electro-Hydraulics Ltd
Electrocon Ltd
English Electric Co Ltd, The
Ericsson Telephones Ltd
Ferranti Ltd
General Electric Co Ltd, The
M.B. Metals Ltd
M.L. Aviation Co Ltd
Newton Bros (Derby) Ltd
Page Engineering Co (Sunbury on Thames) Ltd
Plessey Co Ltd, The
Portsmouth Aviation Ltd
Pullin & Co Ltd, R. B.
R.F.D. Co Ltd
Rotax Ltd
Sheffield Smelting Co Ltd, The
Somers Ltd, J. N.
Specto Ltd
Standard Telephones & Cables Ltd
Taylor (Metal Workers) Ltd, C. F.
Teddington Aircraft Controls Ltd
Thorn Electrical Industries Ltd
Vandyke Engineering Ltd
Vosper Ltd
Western Manufacturing (Reading) Ltd
Whiteley Electrical Radio Co Ltd

ELECTRONIC EQUIPMENT, GENERAL
(See also under Components)

AEI Radio & Electronic Components Division
Airtech Ltd
Andec Ltd
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Armytage Bros (Knottingley) Ltd
Associated Electrical Industries Ltd
Associated Electrical Industries Ltd (Motor & Control Gear Division)
B & M Electronics Ltd
Bell Precision Engineering Co Ltd
Belling & Lee Ltd
Beme Telecommunications Ltd
Blackburn Electronics Ltd
Boulton Paul Aircraft Ltd
Bradley Ltd, G. & E.
Bristol Aircraft Ltd
C & N (Electrical) Ltd
C.W.C. Equipment Ltd
Cossor Instruments Ltd
Cossor Radar & Electronics Ltd
Dawe Instruments Ltd
de Havilland Aircraft Co Ltd, The
EMI Electronics Ltd
Ekco Electronics Ltd
Ericsson Telephones Ltd
Ferranti Ltd
General Electric Co Ltd, The
General Precision Systems Ltd
Graseby Instruments Ltd
Grundy & Partners Ltd
Lancefield Aircraft Components Ltd
M.B. Metals Ltd
M.L. Aviation Co Ltd
McMichael Radio Ltd
Microcell Ltd
Miles Electronics Ltd
Morfax Ltd
Muirhead & Co Ltd
Mullard Equipment Ltd
Page Engineering Co (Sunbury on Thames) Ltd
Plessey Co Ltd, The
Portsmouth Aviation Ltd
Pullin & Co Ltd, R. B.
R.F.D. Co Ltd

[*Continued overleaf*

Plessey constant-speed drive

ANCILLARY INDUSTRY 1961...

Racal Engineering Ltd
Rank Cintel Ltd
Redifon Ltd
Robinson & Partners Ltd, F.C.
Royston Instruments Ltd
Sanders (Electronics) Ltd, W. H.
Savage Ltd, W. Bryan.
Sheffield Smelting Co Ltd, The
Short Bros & Harland Ltd
Solartron Electronic Group Ltd, The
Somers Ltd, J. N.
Southern Instruments Ltd
Specto Ltd
Standard Telephones & Cables Ltd
Teddington Aircraft Controls Ltd
Thorn Electrical Industries Ltd.
Vactric Control Equipment Ltd
Vandyke Engineering Ltd
Venner Electronics Ltd
W.S. Electronics Ltd
Wayne Kerr Laboratories Ltd, The
Whiteley Electrical Radio Co Ltd
Z & I Aero Services Ltd

ENGINE COMPONENTS, GENERAL (Gas turbine)

Associated Electrical Industries Ltd (Motor & Control Gear Division)
Auto Diesels Ltd
Avica Equipment Ltd
Bramah & Co Ltd, J. R.
Burnley Aircraft Products Ltd
de Havilland Aircraft Co Ltd, The
de Havilland Engine Co Ltd, The
Dunlop Rubber Co Ltd
Firth-Derihon Stampings Ltd, The
Hobson Ltd, H. M.
Hymatic Engineering Co Ltd, The
Leytonstone Jig & Tool Co Ltd
Lucas Gas Turbine Equipment Ltd
Miles Engineering Ltd, F. G.
Morfax Ltd
Plessey Co Ltd, The
Rover Gas Turbines Ltd
Samlesbury Engineering Ltd
Spa Guilds Ltd
Teddington Aircraft Controls Ltd
Tubes Ltd
Vandyke Engineering Ltd
Villiers (Tool Developments) Ltd
Wilmot Breeden Ltd

ENGINE COMPONENTS, GENERAL (Piston engine)

Avica Equipment Ltd
de Havilland Engine Co Ltd, The
Dunlop Rubber Co Ltd
Hobson Ltd, H.M.
Hymatic Engineering Co Ltd, The
Leytonstone Jig & Tool Co Ltd
Miles Engineering Ltd, F. G.
Plessey Co Ltd, The
Rollason Aircraft & Engines Ltd
Samlesbury Engineering Ltd
Scottish Aviation Ltd
Spa Guilds Ltd
Teddington Aircraft Controls Ltd
Vandyke Engineering Ltd
Villiers (Tool Developments) Ltd

ENGINE STARTERS AND STARTING EQUIPMENT (See also Ground power units)

Aircraft Ground Equipment Ltd
Associated Electrical Industries Ltd (Motor & Control Gear Division)
Atlas Copco (Great Britain) Ltd
Auto Diesels Ltd
Bell's Asbestos & Engineering Ltd
Blackburn Engines Ltd
Folland Aircraft Ltd
H.M.L. (Engineering) Ltd
Houchin Ltd
I.V. Pressure Controllers Ltd
Partridge, Wilson & Co Ltd
Plessey Co Ltd, The
Rotax Ltd
Rover Gas Turbines Ltd
Standard Telephones & Cables Ltd
Teddington Aircraft Controls Ltd
Westinghouse Brake & Signal Co Ltd
Williams & James (Engineers) Ltd

ESCAPE CHUTES

Cory Bros & Co Ltd (Survival Equipment Division)
Latex Upholstery Ltd
Lea Bridge Industries Ltd
Mayday Equipment Ltd
Transport Seating Ltd

ETCHING, CHEMICAL

Brent Chemical Products Ltd
Imperial Chemical Industries Ltd
Laporte Chemicals Ltd
Mallinson & Sons Ltd, William
Metachemical Processes Ltd
Stuart (London) Ltd, Robert
Titanine Ltd
Walterisation Co Ltd, The

EXPANDED MATERIALS (other than Plastics and Rubber)

Harvey & Co (London) Ltd, G. A.

EXPERIMENTAL WORK—See Design

EXTRUSIONS, HOLLOW

Booth Aluminium Ltd, James
British Aluminium Co Ltd, The
Formica Ltd
Imperial Aluminium Co Ltd
Imperial Chemical Industries Ltd
Kaye Ltd, E. & E.
Low Moor Fine Steels Ltd
Reynolds Tube Co Ltd
Rollet & Co Ltd, H.
Southern Forge Ltd

EXTRUSIONS, LIGHT ALLOY

Accles & Pollock Ltd
Alcan Industries Ltd
Birmetals Ltd
Booth Aluminium Co Ltd, James
British Aluminium Co Ltd, The
French & Sons Ltd, Thomas
High Duty Alloys Ltd
Imperial Aluminium Co Ltd
Kaye Ltd, E. & E.
Low Moor Fine Steels Ltd
Rollet & Co Ltd, H.
Southern Forge Ltd
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

EXTRUSIONS, STEEL

Chesterfield Tube Co Ltd, The
Low Moor Fine Steels Ltd
Macready's Metal Co Ltd
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

FABRIC, AIRFRAME

Aircraft Materials Ltd
Brown Bros (Aircraft) Ltd

FABRIC, CABIN FURNISHING

Bristol Aircraft Ltd
Cox & Son Ltd, John
Fothergill & Harvey Ltd
I.C.I. (Hyde) Ltd
Latex Upholstery Ltd
Rumbold & Co Ltd, L. A.
Samlesbury Engineering Ltd
Williamson & Son Ltd, Jas.

FABRICATIONS, SHEET METAL

Abbey Panel & Sheet Metal Co Ltd
Aircraft Materials Ltd
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Aviation Traders (Engineering) Ltd
Booth Aluminium Ltd, James
Bramah & Co Ltd, J. R.
British Insulated Callender's Cables Ltd
Brockhouse & Co Ltd, J.
Brooklands Aviation Ltd
Burnley Aircraft Products Ltd
Chinn & Co Ltd, J. S.
Cornercroft Ltd
Darchem Engineering Ltd
de Havilland Engine Co Ltd, The
Delaney Gallay Ltd
Edghill Equipment Ltd
Fairey Marine Ltd
Field Aircraft Services Ltd
Grundy & Partners Ltd
Harvey & Co (London) Ltd, G. A.
Henderson Safety Tank Co Ltd
Henshall & Sons (Addlestone) Ltd, W.
Heston Aircraft & Associated Engineers Ltd
Hickman Ltd
Jablo Propellers Ltd
Lancefield Aircraft Components Ltd
Laycock Engineering Ltd
Leytonstone Jig & Tool Co Ltd
Lucas Gas Turbine Equipment Ltd
Marston Excelsior Ltd
Mercury Airfield Equipment Ltd
Middleton Sheet Metal Co Ltd
Morfax Ltd
Plessey Co Ltd, The
R.F.D. Co Ltd
Redwing Ltd
Rollason Aerocessories Ltd
Samlesbury Engineering Ltd
Sankey & Sons Ltd, Joseph
Saro (Anglesey) Ltd
Scotney Ltd, Tom M.
Scottish Aviation Ltd
Serck Radiators Ltd
Skyways Ltd

Sketch of prototype Model GPU 11 starting and servicing unit by Auto Diesels Ltd (a "threefold" unit, 400c/s 60kVA a.c. and 28/112V d.c.)

Taylor (Metal Workers) Ltd, C. F.
Thompson Bros (Bilston) Ltd
Vandyke Engineering Ltd
Western Manufacturing (Reading) Ltd
Whittemore (Aeradio) Ltd, A. J.
Wilmot Breeden Ltd

FABRICATIONS, TUBULAR

Accles & Pollock Ltd
Aviation Traders (Engineering) Ltd
Bramah & Co Ltd, J. R.
Bristol Aerojet Ltd
Coin Insulation Ltd
Edghill Equipment Ltd
Field Aircraft Services Ltd
Harvey & Co (London) Ltd, G. A.
Henderson Safety Tank Co Ltd
Henshall & Sons (Addlestone) Ltd, W.
Lancefield Aircraft Components Ltd
Mercury Airfield Equipment Ltd
Middleton Sheet Metal Co Ltd
Morfax Ltd
Reynolds Tube Co Ltd
Samlesbury Engineering Ltd
Saro (Anglesey) Ltd
Scotney Ltd, Tom M.
Scottish Aviation Ltd
Serck Radiators Ltd
Simmons & Hawker Ltd
Skyways Ltd
Taylor (Metal Workers) Ltd, C. F.
Vandyke Engineering Ltd
Western Manufacturing (Reading) Ltd

FANS (See also Wind tunnels and equipment)

A.K. Fans Ltd
Airscrew Co & Jicwood Ltd, The
B.M.B. (Sales) Ltd
Dowty Rotol Ltd
Dunlop Rubber Co Ltd
Godfrey & Partners Ltd, Sir George
Hordern Richmond Ltd
Plannair Ltd
Vandyke Engineering Ltd

FASTENERS, INCLUDING COWLING AND SPECIAL PURPOSE

Aero Controls Ltd
Carr Fastener Co Ltd
Dzus Fastener Europe Ltd
Guest Keen & Nettlefolds (Midlands) Ltd
King Aircraft Corporation
Oddie, Bradbury & Cull Ltd
Ross Ltd. S. Grahame
Salter & Co Ltd, Geo
Silentbloc Ltd
Unbrako AD

FILING EQUIPMENT, DOCUMENT

Harvey & Co (London) Ltd, G. A.

FILLERS FOR TUBE BENDING

Brent Chemical Products Ltd

FILLERS, METALLIC

Imperial Chemical Industries Ltd
Kenilworth Manufacturing Co Ltd, The
Vokes Ltd

FILLERS, NON-METALLIC

Avon India Rubber Co Ltd, The
Hall & Sons (Bristol & London) Ltd, John
Imperial Chemical Industries Ltd
Kane (Sealants) Ltd, Douglas
Kenilworth Manufacturing Co Ltd, The
Laporte Chemicals Ltd
Vokes Ltd

FILTERS, AIR AND GAS

Auto-Klean Strainers Ltd
Automotive Products Co Ltd
British Oxygen Aviation Services
Burgess Products Ltd
Coopers Mechanical Joints Ltd
Dunlop Rubber Co Ltd
Exactor Ltd
Fairey Engineering Ltd
Hymatic Engineering Co Ltd, The
I.V. Pressure Controllers Ltd
Palmer Aero Products Ltd
Rellumit (London) Ltd
Stream-Line Filters Ltd
Teddington Aircraft Controls Ltd
Vokes Ltd

FILTERS, ELECTRICAL

Airtech Ltd
Belling & Lee Ltd
Beme Telecommunications Ltd
McMichael Radio Ltd
Mullard Equipment Ltd
Plessey Co Ltd, The
Rotax Ltd
Whiteley Electrical Radio Co Ltd

FILTERS, FUEL AND OIL

Aircraft Materials Ltd
Amal Ltd
Auto-Klean Strainers Ltd
Automotive Products Co Ltd
Bosch Ltd
Coopers Mechanical Joints Ltd
Delaney Gallay Ltd
Dowty Rotol Ltd
Fairey Engineering Ltd
I.V. Pressure Controllers Ltd
King Aircraft Corporation
Palmer Aero Products Ltd
Rellumit (London) Ltd
Ross Ltd, S. Grahame
SPE Co Ltd
Simmons & Hawker Ltd
Stream-Line Filters Ltd
Tecalemit Ltd
Teddington Aircraft Controls Ltd
Thermal Control Co Ltd
Vokes Ltd
Zwicky Ltd

FILTERS, OTHER FLUID

Auto-Klean Strainers Ltd
Automotive Products Co Ltd
British Oxygen Aviation Services
Dowty Rotol Ltd
Fairey Engineering Ltd
I.V. Pressure Controllers Ltd
Palmer Aero Products Ltd
Rellumit (London) Ltd
Ross Ltd, S. Grahame
Short Bros & Harland Ltd
Stream-Line Filters Ltd
Tecalemit Ltd
Thermal Control Co Ltd
Vokes Ltd
Zwicky Ltd

FINISHES, AIRCRAFT (See also Paints)

Cellon Ltd
Docker Bros
Durion Ltd
Hall & Sons (Bristol & London) Ltd, John
Imperial Chemical Industries Ltd
Stuart (London) Ltd, Robert
Titanine Ltd

NEW from Delaney Gallay

ALL METAL

VIBRASHOCK ISOLATION

Vibration Control Systems

On Stands 6 & 285

at Farnborough this year

Delaney Galley will be showing this year a new and fully developed type of all-metal vibration control system, designed to protect delicate equipment from vibration and shock.

These units are small, lightweight and accommodate both aerial and radial motion. They have a wide load tolerance and a high damping effect. They require no adjustment or maintenance.

The basic principle of Vibrashock Isolation can be applied in an endless variety of ways to protect virtually any piece of equipment however mounted. We are actively engaged in engineering systems for the aircraft industry and shall be glad both to tell you about our work and discuss your needs.

We shall also be showing:

Thermal Insulation Blankets
Heat Exchangers
Oil Coolers
Water Extractors

Toilet Units
Welding Machines
Examples of Flux Bath Brazing
Vacuum Furnace Brazing
Special Welding Techniques

Flow Turning
All on Stands
6 (Equipment Display) &
285 (Main Exhibition)
where you will be very welcome

Delaney Gallay LTD

Vulcan Works, Edgware Road,
London, N.W.2
Telephone: GLAdstone 2201

An Arsenal of Engineering Machinery

INCLUDING
Power presses up to 500 tons. Stretch forming presses. "Cecostamp" drop hammers. Welding—seam, stitch, spot, argon etc.

An Army of Skilled Engineers

INCLUDING
Craftsmen in sheet metal manipulation, skilled tool makers and fully approved inspection staffs.

AMONG OUR MANY ESTEEMED CUSTOMERS
Bristol Siddeley Engines Ltd.
Carbodies Ltd.
Daimler Company Ltd.
The David Brown Companies.
Ford Motor Company Ltd.
Jaguar Cars Ltd.
John Curran Limited
The Plessey Company Ltd.
Rover Company Ltd.

A.I.D.
A.R.B. and
C.I.A.
APPROVED

& a Chest Full of Medals for jobs well done

FOR DESIGN PROTOTYPE & PRODUCTION WORK, CONTACT—

We Shape the things to come!

The Abbey Panel & Sheet Metal Co. Ltd.

BAYTON ROAD, EXHALL, NR. COVENTRY. TEL: BEDWORTH 2071 (P.B.X)

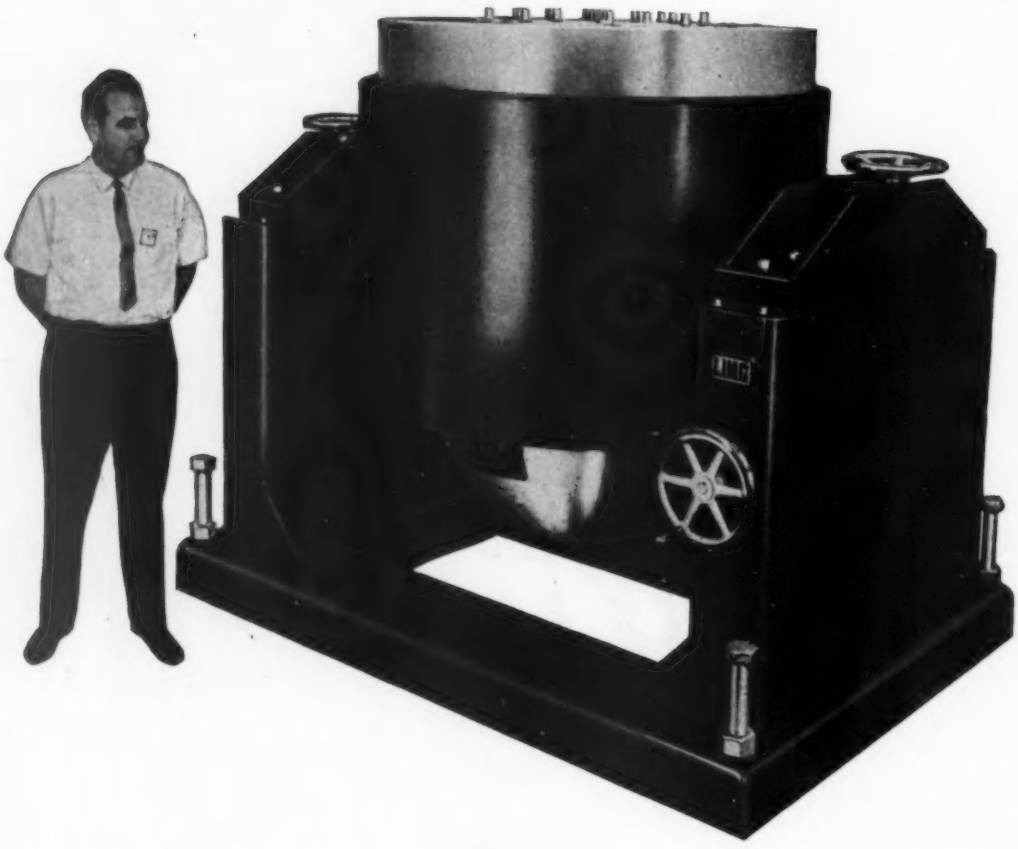
456

LIVES SAVED TO DATE BY MARTIN-BAKER EJECTION SEATS

M·B·A

NOW IT'S PYE LING

A NEW FORCE IN ENVIRONMENTAL ENGINEERING



Pye, one of the foremost names in British electronic engineering, has now consolidated the achievement of its subsidiary, W. Bryan Savage Ltd, and at the same time broadened the scope of its activities by bringing it into association with the great Ling Temco Vought Corporation of America to form a new Company, PYE-LING LIMITED. This organisation will produce a range of Vibration and Fatigue Testing equipment that will be unmatched throughout the world for comprehensiveness and quality. The resources and experience of both the Pye Group and Ling will ensure that the British Aircraft Industry will have immediately available the precise equipment it requires for the proving of every type of component.

The Liquid Cooled Vibrator illustrated has a Thrust Rating of 30,000 lb. and is the largest of a comprehensive range which starts at 25 lb.

PYE LING
VIBRATION ENGINEERS

PYE-LING LIMITED, 7-8 DALSTON GARDENS, STANMORE, MIDDLESEX

AP. 13

ANCILLARY INDUSTRY 1961...

FIRE-FIGHTING AND DETECTION EQUIPMENT, AIRBORNE
British Oxygen Aviation Services
Graviner Manufacturing Co Ltd
Kidde Co Ltd, The Walter
Lucas Gas Turbine Equipment Ltd
M.B. Metals Ltd
Normalair Ltd
Pyrene Co Ltd, The
Scottish Aviation Ltd
Thermal Control Co Ltd

FIRE-FIGHTING EQUIPMENT, GROUND
Douglas (Equipment) Ltd, F. L.
General Fire Appliance Co Ltd, The
Gloster Aircraft Co Ltd
Kidde Co Ltd, The Walter
Miles Ltd, Alf'd
Normalair Ltd
Pyrene Co Ltd, The
R.F.D. Co Ltd
Rover Gas Turbines Ltd
Siebe, Gorman & Co Ltd
Simon Engineering Dudley Ltd
Williams & James (Engineers) Ltd

FIRE-FIGHTING VEHICLES, CHASSIS FOR
Searle Ltd, R. J.
Transport Equipment (Thornycroft) Ltd

FLAME TRAPS
Amal Ltd
Truro Engine Works Ltd

FLAW-DETECTION EQUIPMENT AND MATERIALS
Brent Chemical Products Ltd
Bristol Aircraft Ltd
Brush Crystal Co Ltd
Dawe Instruments Ltd
Manchester Oil Refinery (Sales) Ltd
Palmer Aero Products Ltd
Solus-Schall Ltd
Sperry Gyroscope Co Ltd

FLOTATION GEAR
Beaufort (Air Sea) Equipment Ltd
Fairey Marine Ltd
Frankenstein & Sons (Manchester) Ltd, P.
Jablo Propellers Ltd
Kidde Co Ltd, The Walter
R.F.D. Co Ltd
Ross Ltd, S. Grahame

FLUID, HYDRAULIC
Esso Petroleum Co Ltd
Imperial Chemical Industries Ltd
Kenilworth Manufacturing Co Ltd, The
Lockheed Precision Products Ltd
Monsanto Chemicals Ltd
Vaughan & Co Ltd, Edgar

FLUIDS, ETC, INDUSTRIAL
(other than under specific headings)
Amber Oils Ltd
Imperial Chemical Industries Ltd

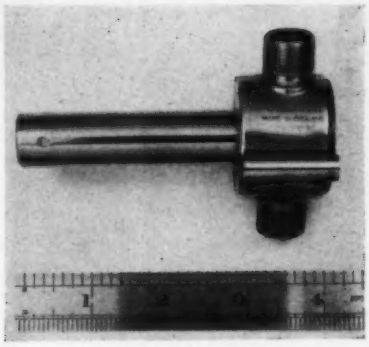
FORGINGS, DROP
Brockhouse & Co Ltd, J.
Dudley Drop Forging Co Ltd
English Steel Forge & Engineering Corporation Ltd
Firth-Derihon Stampings Ltd, The
High Duty Alloys Ltd
Hughes-Johnson Stampings Ltd, The
Light-Metal Forgings Ltd
Macready's Metal Co Ltd
Omes Ltd
Precision Forgings Ltd
Smith-Clayton Forge Ltd
Smith's Stamping Works (Coventry) Ltd
Southern Forge Ltd
Steel, Peech & Tozer
Villiers (Tool Developments) Ltd

FORGINGS IN HEAT-RESISTING MATERIALS
Dudley Drop Forging Co Ltd
Hadfields Ltd
Hughes-Johnson Stampings Ltd, The
Jessop-Saville Ltd
Light-Metal Forgings Ltd
Low Moor Alloy Steelworks Ltd
Macready's Metal Co Ltd
Omes Ltd
Precision Forgings Ltd
Smith-Clayton Forge Ltd
Smith's Stamping Works (Coventry) Ltd
Telcon Metals Ltd
United Steel Companies Ltd, The

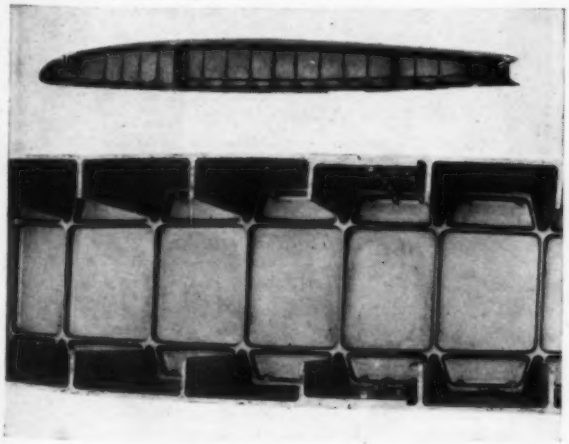
FORGINGS, LIGHT ALLOY
Alcan Industries Ltd
Birmetals Ltd
Booth Aluminium Ltd, James
Dudley Drop Forging Co Ltd
High Duty Alloys Ltd
Kaye Ltd, E. & E.
Light-Metal Forgings Ltd
Low Moor Alloy Steelworks Ltd
Precision Forgings Ltd
Smith-Clayton Forge Ltd
Smith's Stamping Works (Coventry) Ltd
Southern Forge Ltd
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

FORGINGS, STEEL
Brockhouse & Co Ltd, J.
Dudley Drop Forging Co Ltd
English Steel Forge & Engineering Corporation Ltd
Firth & John Brown Ltd, Thos.
Firth-Vickers Stainless Steels Ltd
Flather Ltd, W. T.
Hadfields Ltd
High Duty Alloys Ltd
Hughes-Johnson Stampings Ltd, The
Jessop-Saville Ltd
Kayser, Ellison & Co Ltd
Light-Metal Forgings Ltd
Low Moor Alloy Steelworks Ltd
Macready's Metal Co Ltd
Omes Ltd
Precision Forgings Ltd
Smith-Clayton Forge Ltd
Smith's Stamping Works (Coventry) Ltd

This Graviner sealed fire and overheat detector can be set to detect temperatures from minus 50°C to plus 500°C



Section of Blackburn Buccaneer wing: machined from NAPAL stress-relieved plate produced by Alcan Industries Ltd.



Steel, Peech & Tozer
Telcon Metals Ltd
Tubes Ltd
United Steel Companies Ltd, The
Villiers (Tool Developments) Ltd
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

FORGINGS, OTHER THAN ABOVE
Dudley Drop Forging Co Ltd
Hughes-Johnson Stampings Ltd, The
Jessop-Saville Ltd
Light-Metal Forgings Ltd
Precision Forgings Ltd
Steel, Peech & Tozer
Smith-Clayton Forge Ltd
Stone & Co (Charlton) Ltd, J.
United Steel Companies Ltd, The
Villiers (Tool Developments) Ltd

FREIGHT EQUIPMENT, AIRBORNE
Aerolex Ltd
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Blackburn Aircraft Ltd
Latex Upholstery Ltd
Morfax Ltd
Samlesbury Engineering Ltd
Scotney Ltd, Tom M.
Short Bros & Harland Ltd
Taylor (Plastics) Ltd, C. F.

FREIGHT HANDLING EQUIPMENT
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Aviation Traders (Engineering) Ltd
Blackburn Aircraft Ltd
Coventry Climax Engines Ltd
Didsbury Engineering Co Ltd
Electro-Hydraulics Ltd
French & Sons Ltd, Thomas
King Aircraft Corporation
Lansing Bagnall Ltd
M.L. Aviation Co Ltd
Morfax Ltd
Samlesbury Engineering Ltd
Scotney Ltd, Tom M.
Short Bros & Harland Ltd

FRICTION LININGS
Dunlop Rubber Co Ltd
Goodyear Tyre & Rubber Co (Great Britain) Ltd

FUEL MEASUREMENT AND CALIBRATION EQUIPMENT
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Avery-Hardoll Ltd
Dowty Fuel Systems Ltd
Elliott Bros (London) Ltd
Firth Cleveland Instruments Ltd
Flight Refuelling Ltd
Hobson Ltd, H. M.
Integral Ltd
Kent Ltd, George
Negretti & Zambra Ltd
Simmons & Hawker Ltd
Smiths Aviation Division

FUEL SYSTEMS, ENGINE
Associated Electrical Industries Ltd (Motor & Control Gear Division)
de Havilland Aircraft Co Ltd, The
Dowty Fuel Systems Ltd
Hobson Ltd, H. M.
Lucas Gas Turbine Equipment Ltd
Plessey Co Ltd, The
Teddington Aircraft Controls Ltd

FUELLING EQUIPMENT, AIRCRAFT
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Armstrong Whitworth Equipment
Automotive Products Co Ltd
Avery-Hardoll Ltd
British Oxygen Aviation Services
Exactor Ltd
Flight Refuelling Ltd
Goodyear Tyre & Rubber Co (Great Britain) Ltd
Heston Aircraft & Associated Engineers Ltd
I.C.I. (Hyde) Ltd
Lockheed Precision Products Ltd
Miles Ltd, Alf'd
Rellumit (London) Ltd
SPE Co Ltd
Saro (Anglesey) Ltd
Stream-Line Filters Ltd
Taylor (Metal Workers) Ltd, C. F.
Tecalemit Ltd
Teddington Aircraft Controls Ltd
Thompson Bros (Bilston) Ltd
Truro Engine Works Ltd
Wayne-Tank & Pump Co Ltd
Zwicky Ltd

FUELLING EQUIPMENT, ROCKET, ETC
Armstrong Whitworth Aircraft Ltd Sir W. G.
Exactor Ltd
Flight Refuelling Ltd
Rellumit (London) Ltd
Saro (Anglesey) Ltd
Teddington Aircraft Controls Ltd

FUELS, AIRCRAFT
British Oxygen Aviation Services
Esso Petroleum Co Ltd
Imperial Chemical Industries Ltd
Regent Oil Co Ltd
Shell-Mex & BP Ltd
Universal Flying Services Ltd

FUELS, ROCKET, ETC
British Oxygen Aviation Services
Laporte Chemicals Ltd
Shell-Mex & BP Ltd

FURNISHING EQUIPMENT AIRCRAFT
Aerocontacts (Aircraft Distributors) Ltd
Aircraft Furnishing Ltd
Airscrew Co & Jicwood Ltd, The
Benson Aircraft Interior Furnishing Ltd, J. J.
Hickman Ltd
Lancefield Aircraft Components Ltd
Latex Upholstery Ltd
Microcell Ltd
Parnall & Co Ltd, George
Samlesbury Engineering Ltd
Taylor (Metal Workers) Ltd, C. F.
Taylor (Plastics) Ltd, C. F.
Thermo-Plastics Ltd
Thorn Electrical Industries Ltd
Transport Seating Ltd

ADDRESSES OF COMPANIES: pages 349-355

ANCILLARY INDUSTRY 1961...

Murex ground power unit, as recently supplied to BOAC, capable of supplying 2,000A for engine starting

FUSES
Belling & Lee Ltd
British Insulated Callender's Cables Ltd
C.W.C. Equipment Ltd
English Electric Co Ltd, The
General Electric Co Ltd, The
Graseby Instruments Ltd
Newton & Co Ltd, H. T.
Rotax Ltd

GALLEY EQUIPMENT
Aerogalley Ltd
Attewell & Sons Ltd, B.
Aviation Traders (Engineering) Ltd
Field Aircraft Services Ltd
General Electric Co Ltd, The
Henshall & Sons (Addlestone) Ltd, W.
Jablo Propellers Ltd
Lancefield Aircraft Components Ltd
Lec Refrigeration Ltd
Mallinson & Sons, William
Redwing Ltd
Samlesbury Engineering Ltd
Saunders Valve Co Ltd
Taylor (Metal Workers) Ltd, C. F.
Taylor (Plastics) Ltd, C. F.
Thermo-Plastics Ltd

GASES, LIQUEFIED
British Oxygen Aviation Services
Imperial Chemical Industries Ltd
Sparklets Products (British Oxygen Co Ltd.)

GASES, LIQUEFIED, HANDLING EQUIPMENT FOR
British Oxygen Aviation Services
Imperial Chemical Industries Ltd
Marston Excelsior Ltd
Siebe, Gorman & Co Ltd

GASKETS
AEI Radio & Electronic Components Division
Aircraft Materials Ltd
Attewell & Sons Ltd, B.
Avon India Rubber Co Ltd, The
Beldam Asbestos Co Ltd
Bell's Asbestos & Engineering Ltd
C.W.C. Equipment Ltd
Coin Insulation Ltd
Coopers Mechanical Joints Ltd
Dowty Seals Ltd
Fireproof Tanks Ltd
Hall & Hall Ltd
Kautex Ltd
Northern Rubber Co Ltd, The
Precision Rubbers Ltd
Walker & Co Ltd, James
Wills Pressure Filled Joint Ring Ltd

GAUGES, STRAIN
Boulton Paul Aircraft Ltd
Brush Crystal Co Ltd
de Havilland Aircraft Co Ltd, The
Mullard Equipment Ltd
Salford Electrical Instruments Ltd
Technical Ceramics Ltd
Westland Aircraft Ltd (Saunders-Roe Division)

GEARS AND GEAR SYSTEMS
Bristol Aircraft Ltd
Coin Insulation Ltd
E.N.V. Engineering Co Ltd
Gear Grinding Co Ltd, The
Graseby Instruments Ltd
Hobson Ltd, H. M.
Miles Engineering Ltd, F. G.
Opperman Ltd, S. E.
Vactric Control Equipment Ltd

GENERATORS, ELECTRIC
Associated Electrical Industries Ltd (Motor & Control Gear Division)
Auto Diesels Ltd
Bosch Ltd
de Havilland Aircraft Co Ltd, The
English Electric Co Ltd, The
General Electric Co Ltd, The
Ketay Ltd
Petbow Ltd (Liverpool Works)
Plessey Co Ltd, The

GLASS, SAFETY, INCLUDING LAMINATED AND TOUGHENED
Coin Insulation Ltd
Fothergill & Harvey Ltd
Jablo Propellers Ltd
Microcell Ltd
Suntex Safety Glass Industries Ltd
Triplex Safety Glass Co Ltd

GLIDER EQUIPMENT
British Oxygen Aviation Services

GOVERNORS
(See also Controls, automatic)
de Havilland Aircraft Co Ltd, The
Hobson Ltd, H. M.

GRINDING EQUIPMENT
(See also Tools, machine)
Atlas Copco (Great Britain) Ltd
Gear Grinding Co Ltd, The
Leytonstone Jig & Tool Co Ltd

GROUND POWER UNITS
(See also Starters, engine)
Aircraft Ground Equipment Ltd
Atlas Copco (Great Britain) Ltd
Auto Diesels Ltd
Blackburn Engines Ltd
Douglas (Equipment) Ltd, F. L.
Dunlop Rubber Co Ltd
Houchin Ltd
I.V. Pressure Controllers Ltd
Murex Welding Processes Ltd
Partridge, Wilson & Co Ltd
Petbow Ltd
Petbow Ltd (Liverpool Works)
Rollason Aerocessories Ltd
Rover Gas Turbines Ltd
Westinghouse Brake & Signal Co Ltd
Williams & James (Engineers) Ltd

GUIDED-WEAPON EQUIPMENT
Appleby & Ireland Ltd
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Autoset (Production) Ltd
Avimo Ltd
Beme Telecommunications Ltd
Boulton Paul Aircraft Ltd
Bristol Aerojet Ltd
Bristol Aircraft Ltd
British Oxygen Aviation Services
Brown Ltd, S. G.
Cossor Radar & Electronics Ltd
de Havilland Aircraft Co Ltd, The
Didsbury Engineering Co Ltd
Dunlop Rubber Co Ltd
Electro-Hydraulics Ltd
English Electric Aviation Ltd (Guided Weapons Division)
English Electric Co Ltd, The
Fairey Engineering Ltd
Ferranti Ltd
Flight Refuelling Ltd
General Electric Co Ltd, The
Graseby Instruments Ltd
High Pressure Components Ltd
Hobson Ltd, H. M.
I.V. Pressure Controllers Ltd
Leytonstone Jig & Tool Co Ltd
M.B. Metals Ltd
M.L. Aviation Co Ltd
McMichael Radio Ltd
Middleton Sheet Metal Co Ltd
Mitchell Hydraulics Ltd
Morfax Ltd
Plessey Co Ltd, The
Portsmouth Aviation Ltd
Redwing Ltd
Short Bros & Harland Ltd
Specto Ltd
Sperry Gyroscope Co Ltd
Taylor (Metal Workers) Ltd, C. F.
Teddington Aircraft Controls Ltd
Vandyke Engineering Ltd
Venner Accumulators Ltd
Whiteley Electrical Radio Co Ltd
Williams & James (Engineers) Ltd

GUNS—See Armament

GYRO SYSTEMS
Brown Ltd, S. G.
de Havilland Aircraft Co Ltd, The
English Electric Aviation Ltd (Guided Weapons Division)
Ferranti Ltd
Graseby Instruments Ltd
Honeywell Controls Ltd
Newmark Ltd, Louis
Reid & Sigrist Ltd
Short Bros & Harland Ltd
Smiths Aviation Division
Sperry Gyroscope Co Ltd
Test Equipment Ltd

HAIR, RUBBERIZED, FOR PACKAGING, UPHOLSTERY, ETC
Hairlock Co Ltd, The
Latex Upholstery Ltd
Microcell Ltd
Reynolds (Packaging) Ltd

HANDLING EQUIPMENT, AIRCRAFT
(other than Tractors)
Airtech Ltd
Auto Diesels Ltd
Aviation Traders (Engineering) Ltd
Chinn & Co Ltd, J. S.
Curran Ltd, John
Didsbury Engineering Co Ltd
Douglas (Equipment) Ltd, F. L.
Edghill Equipment Ltd
Electro-Hydraulics Ltd
Lancefield Aircraft Components Ltd
Leytonstone Jig & Tool Co Ltd
M.L. Aviation Co Ltd
Morfax Ltd
Portsmouth Aviation Ltd
Ross Ltd, S. Grahame
Samlesbury Engineering Ltd
Vaughan Crane Co Ltd, The

HANGARAGE
Derby Aviation Ltd
McAlpine Aviation
Skyways Ltd
Universal Flying Services Ltd
Whittemore (Aeradio) Ltd, A. J.

HANGARS
British Insulated Callender's Cables Ltd
Morfax Ltd

HARNESS, WIRING
Aero Electronics Ltd
Aircraft-Marine Products (G.B.) Ltd
Amphenol-Borg Ltd
Avica Equipment Ltd
British Insulated Callender's Cables Ltd
C.W.C. Equipment Ltd
Electrocon Ltd
Grundy & Partners Ltd
Leytonstone Jig & Tool Co Ltd
Palmer Aero Products Ltd
Plessey Co Ltd, The
R.F.D. Co Ltd
Rist's Wires & Cables Ltd
Rotax Ltd
Whittemore (Aeradio) Ltd, A. J.

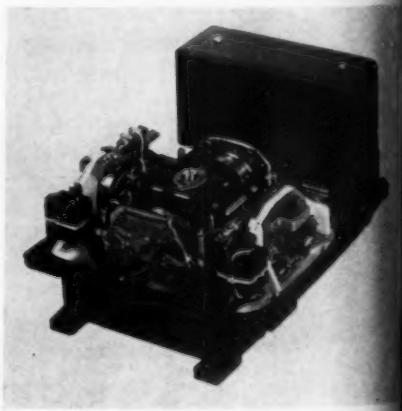
HARNESSES, AIRCREW, AND FITTINGS
Aircraft Materials Ltd
G.Q. Parachute Co Ltd
Lancefield Aircraft Components Ltd
Teleflex Products Ltd

HEADPHONES AND HEADSETS
Airmed Ltd
Amplivox Ltd
Anticoustic Co, The
Brown Ltd, S. G.
Ericsson Telephones Ltd
Standard Telephones & Cables Ltd
Whittemore (Aeradio) Ltd, A. J.

HEATERS, AIRCRAFT
Baxter, Woodhouse & Taylor Ltd
Dragonair Ltd
General Electric Co Ltd, The
Lucas Gas Turbine Equipment Ltd
Marston Excelsior Ltd
Plannair Ltd
Vandyke Engineering Ltd

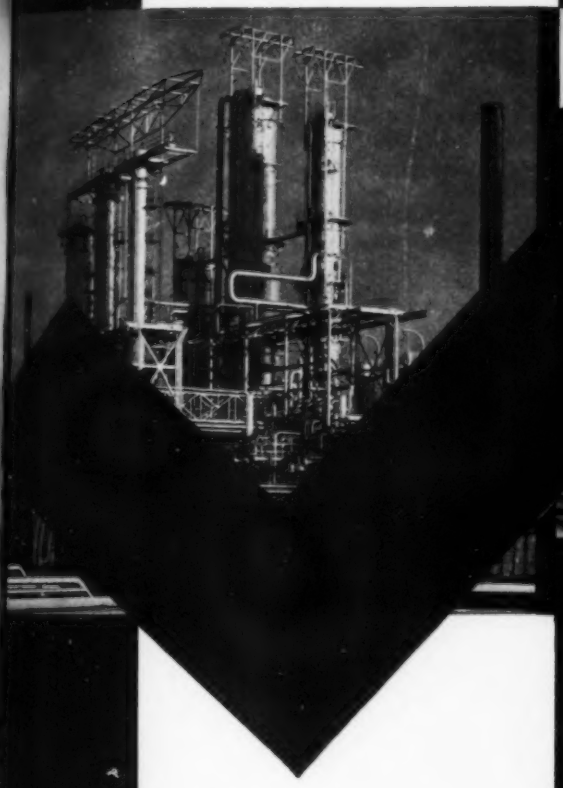
HEATERS, HANGAR AND FACTORY
Dragonair Ltd
General Electric Co Ltd, The
Hunting Mhoglas Ltd

HEAT EXCHANGERS
B.M.B. (Sales) Ltd
Delaney Gallay Ltd
Fairey Engineering Ltd
Harvey & Co (London) Ltd, G. A.
Lucas Gas Turbine Equipment Ltd
M.L. Aviation Co Ltd
Marston Excelsior Ltd
Sankey & Sons Ltd, Joseph
Serck Radiators Ltd
Smith Ltd, Herman
Vandyke Engineering Ltd
Wilmot Breeden Ltd



Sperry V.L.G.2 precision vertical gyro

We
take
nothing
(absolutely nothing)
for
granted



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We leave nothing to chance.
The purity of Shell Aviation Fuels
is safeguarded at all stages
from refinery to aircraft
on a journey which may extend
half way round the world.
By an elaborate system of checks,
laboratory tests and
handling techniques Shell ensure
that *safety is no accident*.

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First aloft — and still ahead — CMC airborne Doppler sensors provide reliable, accurate navigational information — irrespective of time, terrain or weather. Carried wholly within the aircraft . . . entirely independent of ground-based aids . . . the CMA-620 series continues to show the way for the airlines of the world. Of *all* Doppler equipped international jets, by far the greater proportion uses the CANADIAN MARCONI COMPANY system.

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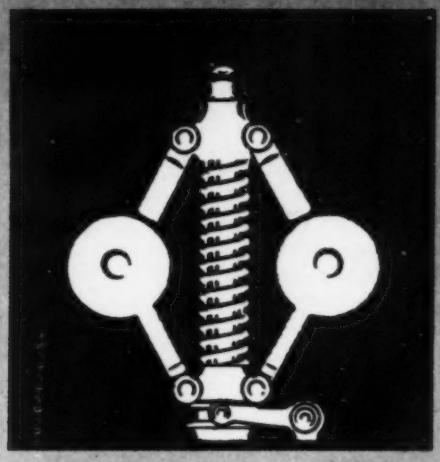

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The services of our engineers are available in evolving special-purpose control units of sensitivity and dependability, whatever their function.

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CHARLES ST., WARWICK, ENGLAND
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Today's jet services land on **Firestone** tyres

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SEE FIRESTONE ON STAND NO. 7 AT THE S.B.A.C. EXHIBITION

Firestone TYRES — consistently good

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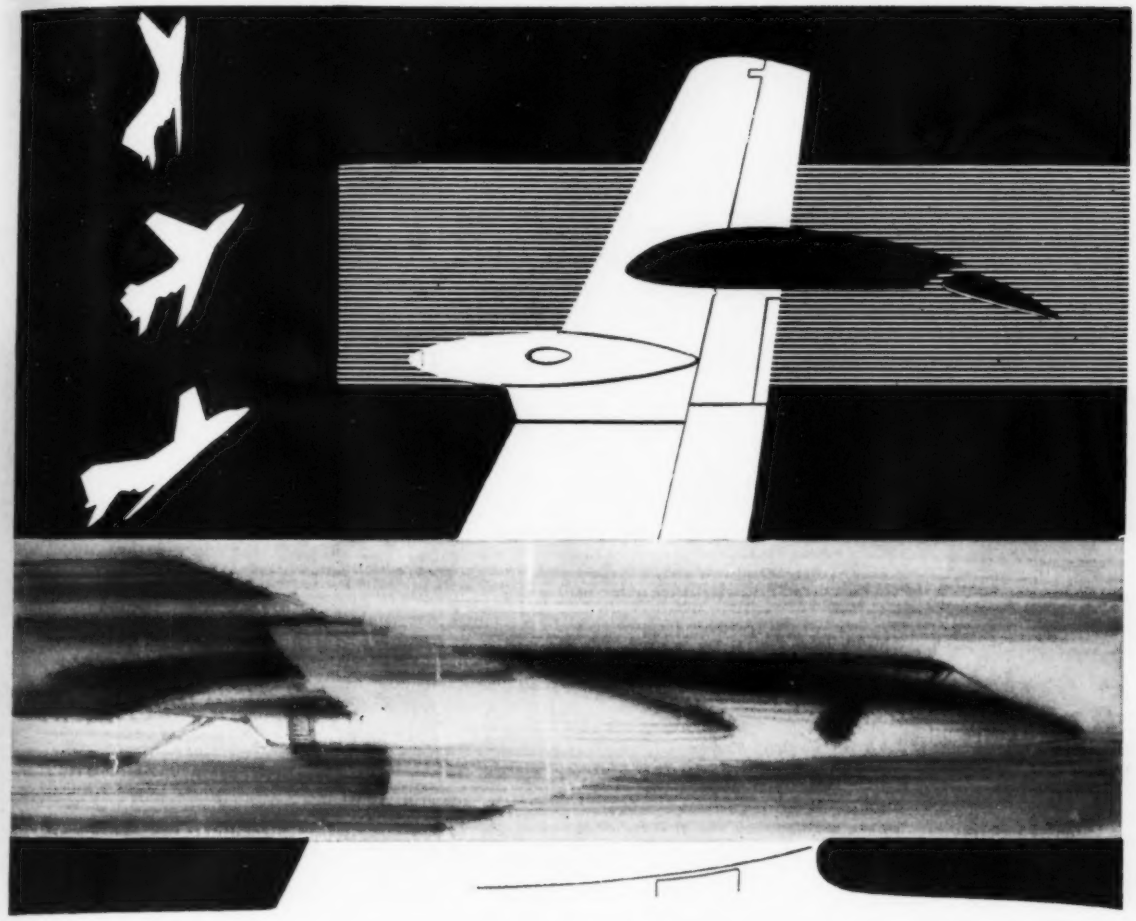
AEI POWER FOR FLIGHT

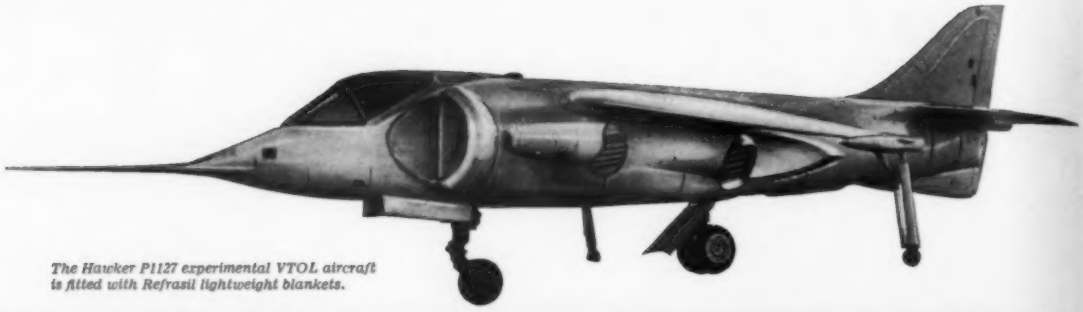


...MAKES CONTROL SURE

An aircraft manoeuvres at high speed . . . AEI electro-hydraulic equipment governs the sure movement of its control surfaces.
Aircraft electrical gear supplied by AEI is meeting every modern military and civil requirement, covering ignition systems, airborne power generating plant, switchgear, and electric motors – some developed specially to drive pumps in emergency hydraulic systems and for electro-hydraulic powered flying controls.

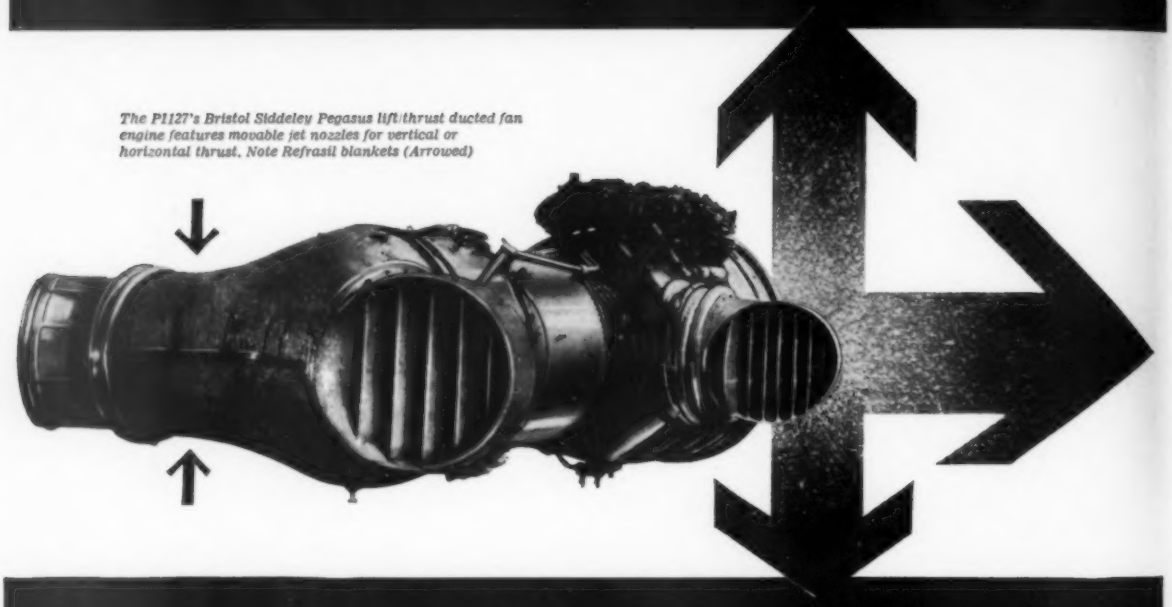
AEI

SEE US AT THE S.B.A.C. SHOW AT FARNBOROUGH



The Hawker P1127 experimental VTOL aircraft is fitted with Refrasil lightweight blankets.

The P1127's Bristol Siddeley Pegasus lift/thrust ducted fan engine features movable jet nozzles for vertical or horizontal thrust. Note Refrasil blankets (Arrowed)



SINCE THE EARLY DAYS of jet aircraft, Refrasil has played a vital part in high temperature insulation. Today Refrasil is used in most experimental projects, including the Hawker P1127 VTOL aircraft, as well as the majority of British production engines and aircraft. Why? Because Refrasil blankets can withstand continuous temperatures of 1,000°C. Further, they are precision made to the specific needs of a development programme or other application. A prototype shop is an invaluable part of the Design, Technical, Advisory and Maintenance services operated by Darchem Engineering before and after sale. And, another production point: no aircraft programme has ever been held up for deliveries. Whenever you have an insulation problem consult Darchem Engineering.

STAND
NO 267

Photo: "Flight" *Aero Show 1911*

There have been many breakthroughs since 1911

From aviation's earliest days, still remembered by some of us for their atmosphere of dope and daring, Cellon aircraft finishes have remained in the forefront of development and progress. Today, there are Cellon finishes for all interior and exterior surfaces, each possessing special qualities of resistance and durability to withstand the operational rigours involved.

CELLON AIRCRAFT FINISHES 1911-1961

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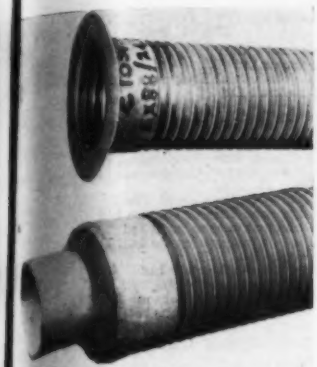
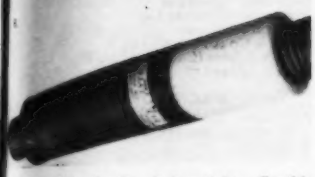
- CELLON C.C. Heat Resistant High Speed Finishes
- CELLON Scheme "Z" Finishes for Civil Aircraft
- CELLON C.S. Finishes for Crop Spraying Aircraft
- CELLON Corrosion Resistant Primers & Interior Finishing Schemes
- CELLON Chemical Contouring System

Photograph by courtesy of "Flight".





"Flexflyte" lightweight flexible ducting with non-standard terminations. The lower example has built-in thermal insulation (Flexible Ducting Ltd)

Kelvin Hughes (Smiths) split-pointer ASI for Vickers VC10, showing 150kt (left) and 280kt. On the right is seen the company's servo-driven precision altimeter for the same aircraft

ANCILLARY INDUSTRY 1961...

HEAT-RESISTANT MATERIALS, OTHER THAN ALLOYS

Avon India Rubber Co Ltd, The
Bell's Asbestos & Engineering Ltd
Coin Insulation Ltd
Darchem Engineering Ltd
Delaney Gallay Ltd
Fothergill & Harvey Ltd
Imperial Chemical Industries Ltd
Miles Marine & Structural Plastics Ltd

HEATING EQUIPMENT, INDUSTRIAL PROCESS

Associated Electrical Industries Ltd
Hunting Mhoglas Ltd
Isopad Ltd
Taylor (Metal Workers) Ltd, C. F.

HONEYCOMB, METAL

CIBA (A.R.L.) Ltd
Darchem Engineering Ltd

HOSE, FLEXIBLE

Accles & Pollock Ltd
Avica Equipment Ltd
Avon India Rubber Co Ltd, The
Baxter, Woodhouse & Taylor Ltd
Beldam Asbestos Co Ltd
Bell's Asbestos & Engineering Ltd
British Ermeto Corporation Ltd
British Oxygen Aviation Services Ltd
Dunlop Rubber Co Ltd
Flexible Ducting Ltd
Formica Ltd
King Aircraft Corporation Ltd
Lockheed Precision Products Ltd
Morfax Ltd
Northern Rubber Co Ltd, The
Palmer Aero Products Ltd
Power Auxiliaries Ltd
SPE Co Ltd
Tecalemit Ltd
Super Oil Seals & Gaskets Ltd

HYDRAULIC EQUIPMENT

Armstrong Whitworth Aircraft Ltd, Sir W. G.
Armstrong Whitworth Equipment
Armytage Bros (Knottingley) Ltd
Boulton Paul Aircraft Ltd
Brown Bros (Aircraft) Ltd
Dowty Rotol Ltd
Dunlop Rubber Co Ltd
Electro-Hydraulics Ltd
English Electric Co Ltd, The
Exactor Ltd
Fairey Engineering Ltd
Goodyear Tyre & Rubber Co (Great Britain) Ltd
H.M.L. (Engineering) Ltd
High Pressure Components Ltd
Hobson Ltd, H. M.
Hydraulics & Pneumatics Ltd
I.V. Pressure Controllers Ltd
Integral Ltd
Lockheed Precision Products Ltd
Lucas Gas Turbine Equipment Ltd
Mitchell Hydraulics Ltd
Palmer Aero Products Ltd
Plessey Co Ltd, The
Ross Ltd, S. Grahame
SPE Co Ltd
Short Bros & Harland Ltd
Sperry Gyroscope Co Ltd
Teddington Aircraft Controls Ltd
Villiers (Tool Developments) Ltd

IGNITION EQUIPMENT

Associated Electrical Industries Ltd. (Motor & Control Gear Division)
Bosch Ltd
Electrocon Ltd
Lodge Plugs Ltd
Plessey Co Ltd, The
Rotax Ltd
Smiths Aviation Division
Teddington Aircraft Controls Ltd

INSPECTION EQUIPMENT

Blackburn Electronics Ltd
Brent Chemical Products Ltd
Bryans Aeroquipment Ltd
Graseby Instruments Ltd
Heston Aircraft & Associated Engineers Ltd
Infra Red Development Co Ltd, The
Leytonstone Jig & Tool Co Ltd
M.L. Aviation Co Ltd
Newmark Ltd, Louis
Optical Measuring Tools Ltd
Solus-Schall Ltd
Taylor, Taylor & Hobson
Whiteley Electrical Radio Co Ltd

INSTRUMENTS, AIRCRAFT AND ENGINE

Appleby & Ireland Ltd
Astralux Ltd
Avimo Ltd
Brown Ltd, S. G.
Dowty Electrics Ltd
Elliott Bros (London) Ltd
Ferranti Ltd
Firth Cleveland Instruments Ltd
Mechanism Ltd
Miles Electronics Ltd
Munro Ltd, R. W.
Negretti & Zambra Ltd
Newmark Ltd, Louis
Page Engineering Co (Sunbury on Thames) Ltd
Pullin & Co Ltd, R. B.
Reid & Sigrist Ltd
Sangamo Weston Ltd
Smiths Aviation Division
Sperry Gyroscope Co Ltd
Ultra Electronics Ltd
Vandyke Engineering Ltd

INSTRUMENTS, FATIGUE-MEASURING

de Havilland Aircraft Co Ltd, The
Graseby Instruments Ltd
Mechanism Ltd
Royston Instruments Ltd
Solus-Schall Ltd
Vandyke Engineering Ltd

INSTRUMENTS OTHER THAN ABOVE

(See under Test equipment, Drawing office equipment, etc)

INSULATION, ELECTRICAL

AEI Radio & Electronic Components Division
Amber Oils Ltd
Coin Insulation Ltd
Darchem Engineering Ltd
Fibreglass Ltd
General Electric Co Ltd, The
Imperial Chemical Industries Ltd
Micanite & Insulators Co Ltd, The
Taylor (Plastics) Ltd, C. F.
Tufnol Ltd

INSULATION, SOUND

Bell's Asbestos & Engineering Ltd
Cullum & Co Ltd, Horace
Cullum Detuners Ltd
Delaney Gallay Ltd
Fibreglass Ltd
Jablo Propellers Ltd
Microcell Ltd
Newalls Insulation Co Ltd
Taylor (Plastics) Ltd, C. F.
Thermo-Plastics Ltd

INSULATION, THERMAL

Beldam Asbestos Co Ltd
Bell's Asbestos & Engineering Ltd
Darchem Engineering Ltd
Delaney Gallay Ltd
Fibreglass Ltd
Fothergill & Harvey Ltd
Jabio Propellers Ltd
Miles Marine & Structural Plastics Ltd
Monsanto Chemicals Ltd
Newalls Insulation Co Ltd
Taylor (Plastics) Ltd, C. F
Thermo-Plastics Ltd
Tufnol Ltd

INSURANCE

British Aviation Insurance Co Ltd, The
Denney, O'Hara Ltd
Helicopter Sales Ltd
Lep Transport Ltd
Whittemore (Aeradio) Ltd, A. J.

JACKS (AIRCRAFT COMPONENT)

Aeronautical Trades & Manufacturing Co Ltd
Auto Diesels Ltd
Brown Bros (Aircraft) Ltd
Dowty Rotol Ltd
Dunlop Rubber Co Ltd
Electro-Hydraulics Ltd
Fairey Engineering Ltd
Hobson Ltd, H. M.
Hymatic Engineering Co Ltd, The
Leytonstone Jig & Tool Co Ltd
Mitchell Hydraulics Ltd
Palmer Aero Products Ltd
Plessey Co Ltd, The
Ross Ltd, S. Grahame
Rotax Ltd
Sperry Gyroscope Co Ltd
Standard Telephones & Cables Ltd
Teleflex Products Ltd

JACKS (LIFTING FOR MAINTENANCE, ETC)

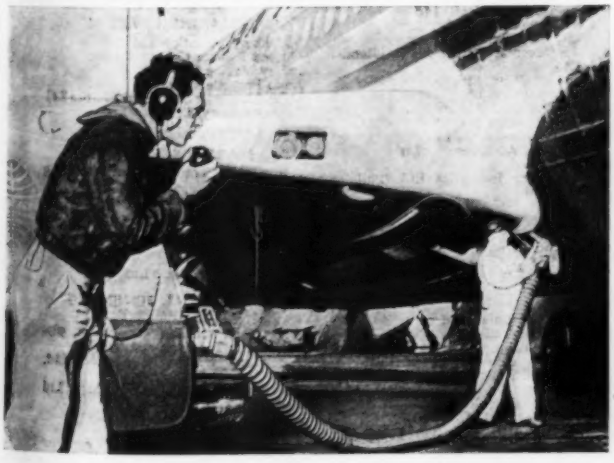
Aeronautical Trades & Manufacturing Co Ltd
Auto Diesels Ltd
Brown Bros (Aircraft) Ltd
Didsbury Engineering Co Ltd
Edghill Equipment Ltd
Exactor Ltd
Flexello Castors & Wheels Ltd
Leytonstone Jig & Tool Co Ltd
Mitchell Hydraulics Ltd
Ross Ltd, S. Grahame
Skyhi Ltd

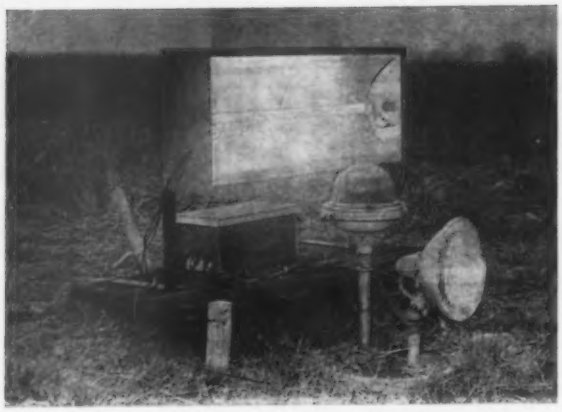
JIGS AND FIXTURES

Aero Controls Ltd
Aircraft Materials Ltd
Attewell & Sons Ltd, B.
Auto Diesels Ltd
Aviation Traders (Engineering) Ltd
Bell Precision Engineering Co Ltd
Birmingham & Blackburn Construction Co Ltd
Boulton Paul Aircraft Ltd
Bristol Aircraft Ltd
British Manufacture & Research Co Ltd

[*Continued overleaf*

Being shown for the first time in Britain—by King Aircraft Corporation at the SBAC Show—is Thermoid-Quaker jet starter hose





New Mazda 200W sodium linear lamp and projector under test on the threshold of the main runway at Stansted (AEI Lamp & Lighting Co Ltd)

ANCILLARY INDUSTRY 1961...

British Oxygen Co Ltd
Brooklands Aviation Ltd
CJC Developments (Portsmouth) Ltd
Chinn & Co Ltd, J. S.
Cornercroft Ltd
Cramic Aircraft Components Ltd
Gloster Aircraft Co Ltd
Gloster Engineering (Cheltenham) Ltd
Heston Aircraft & Associated Engineers Ltd
Hordern Richmond Ltd
Lancefield Aircraft Components Ltd
Leytonstone Jig & Tool Co Ltd
Miles Engineering Ltd, F. G.
Miles Marine & Structural Plastics Ltd
Mollart Engineering Co Ltd, The
Morfax Ltd
Samlesbury Engineering Ltd
Scottish Aviation Ltd
Taylor (Plastics) Ltd, C. F.
Thompson (Engineers) Ltd, Raymond F.
Tufnol Ltd
Vandyke Engineering Ltd
Villiers (Tool Developments) Ltd
Western Manufacturing (Reading) Ltd

JIGS AND FIXTURES, STANDARD PARTS FOR CONSTRUCTION OF

Bristol Aircraft Ltd
British Oxygen Co Ltd
Brooklands Aviation Ltd
Chinn & Co Ltd, J. S.
Leytonstone Jig & Tool Co Ltd
Purefoy Unit Tooling Ltd
Samlesbury Engineering Ltd
Villiers (Tool Developments) Ltd

JOINTING MATERIALS AND COMPOUNDS

(See also Gaskets, Seals, Sealants, and Sealants, runway jointing)

Aircraft Materials Ltd
Attewell & Sons Ltd, B.
Avon India Rubber Co Ltd, The
Beldam Asbestos Co Ltd
Bell's Asbestos & Engineering Ltd
British Insulated Callender's Cables Ltd
British Paints Ltd
Coin Insulation Ltd
Coopers Mechanical Joints Ltd
Goodyear Tyre & Rubber Co (Great Britain) Ltd
Hall & Hall Ltd
Imperial Chemical Industries Ltd
Jablo Propellers Ltd
Kane (Sealants) Ltd, Douglas
Kautex Ltd
Kenilworth Manufacturing Co Ltd, The
Northern Rubber Co Ltd, The
Titanine Ltd
Trist & Co Ltd, Ronald
Turner Bros Asbestos Co Ltd
Vaughan & Co Ltd, Edgar
Walker & Co Ltd, James
Wills Pressure Filled Joint Ring Ltd

JOINTS, UNIVERSAL

Aero Controls Ltd
Hardy Spicer Ltd
Leytonstone Jig & Tool Co Ltd
Middleton Sheet Metal Co Ltd
Mollart Engineering Co Ltd, The
Teddington Aircraft Controls Ltd

LABELS—See Nameplates

LABORATORY EQUIPMENT

(See also Test equipment)

B.M.B. (Sales) Ltd
Bristol Aircraft Ltd
Bryans Aeroquipment Ltd
Cossor Instruments Ltd
Dobbie McInnes (Electronics) Ltd
Ferranti Ltd
General Electric Co Ltd, The
Graseby Instruments Ltd
Grundy & Partners Ltd
Miles Engineering Ltd, F. G.
Newmark Ltd, Louis
Sanders (Electronics) Ltd, W. H.
Venner Electronics Ltd
Whiteley Electrical Radio Co Ltd

LADDERS—See Access equipment

LANDING GEAR

de Havilland Aircraft Co Ltd, The
Dowty Rotol Ltd
Electro-Hydraulics Ltd
Fairey Engineering Ltd
Lockheed Precision Products Ltd

LEAD

Cox Bros & Co (Derby) Ltd

LEATHER

Connolly Bros (Curriers) Ltd

LEATHERCLOTH

Cox & Son Ltd, John
I.C.I. (Hyde) Ltd
Industrial Leather Products Ltd
Williamson & Son Ltd, Jas.

LIFEJACKETS

Beaufort (Air Sea) Equipment Ltd
Cory Bros & Co Ltd (Survival Equipment Division)
Frankenstein & Sons (Manchester) Ltd, P.
Jablo Propellers Ltd
Lea Bridge Industries Ltd
Mayday Equipment Ltd
R.F.D. Co Ltd

LIFE-SAVING EQUIPMENT OTHER THAN SPECIFIED ITEMS

Aircraft Materials Ltd
Beaufort (Air Sea) Equipment Ltd
Bristol Aerojet Ltd
Burndept Ltd
Cory Bros & Co Ltd (Survival Equipment Division)
Frankenstein & Sons (Manchester) Ltd, P.
G.Q. Parachute Co Ltd
Irving Air Chute of Great Britain Ltd
Kidde Co Ltd, The Walter
Lea Bridge Industries Ltd
M.L. Aviation Co Ltd
Martin-Baker Aircraft Co Ltd
Mayday Equipment Ltd
Miles Marine & Structural Plastics Ltd
R.F.D. Co Ltd
Schermuly Pistol Rocket Apparatus Ltd, The
Siebe, Gorman & Co Ltd
Sparklets Products (British Oxygen Co Ltd)
Thermo-Plastics Ltd
Ultra Electronics Ltd
Venner Accumulators Ltd
WAECO Ltd, Marine Division (Air/Sea Rescue)
Ward, Brooke & Co Ltd

LIGHTING EQUIPMENT, AIRCRAFT

AEI Lamp & Lighting Co Ltd
Associated Electrical Industries Ltd (Motor & Control Gear Division)
General Electric Co Ltd, The
Harley Aircraft Landing Lamps
M.B. Metals Ltd
Page Engineering Co (Sunbury on Thames) Ltd
Plessey Co Ltd, The
Rotax Ltd
Thorn Electrical Industries Ltd
Ward, Brooke & Co Ltd

LIGHTING EQUIPMENT, AIRFIELD

AEI Lamp & Lighting Co Ltd
Auto Diesels Ltd
General Electric Co Ltd, The
Gloster Aircraft Co Ltd
Harley Aircraft Landing Lamps
Miles Ltd, Alf'd
Stone-Chance Ltd
Thorn Electrical Industries Ltd

LIGHTING EQUIPMENT, FACTORY AND OFFICE

AEI Lamp & Lighting Co Ltd
Auto Diesels Ltd
C.W.C. Equipment Ltd
Thermo-Plastics Ltd
Thorn Electrical Industries Ltd

LOCK WASHERS, LEAKPROOF

Aircraft Materials Ltd
Dowty Seals Ltd
Kane (Sealants) Ltd, Douglas

LOCKNUTS

Aircraft Materials Ltd
Brown Bros (Aircraft) Ltd
Carr Fastener Co Ltd
Girdlestone Pumps Ltd
Guest Keen & Nettlefolds (Midlands) Ltd
Kane (Sealants) Ltd, Douglas
Miller Aviation Ltd
Rawlplug Co Ltd, The
Ross, Courtney & Co Ltd
Rubery Owen & Co Ltd
Simmonds Aerocessories Ltd
Unbrako AD
Whitehouse Industries Ltd (Philidas Division)

LOCKS, DOOR

Midland Aeroquipment Ltd
Ross Ltd, S. Grahame

LUBRICANTS

Aircraft Materials Ltd
Amber Oils Ltd
Castrol Ltd
Esso Petroleum Co Ltd
Imperial Chemical Industries Ltd
Manchester Oil Refinery (Sales) Ltd
Monsanto Chemicals Ltd
Regent Oil Co Ltd
Shell-Mex & BP Ltd
Vaughan & Co Ltd, Edgar

LUBRICATING EQUIPMENT FOR SERVICING

Castrol Ltd
Exactor Ltd
Step Industrial Equipment Ltd
Tecalemit Ltd

MACHINES, SPECIAL-PURPOSE

Aero Controls Ltd
Armytage Bros (Knottingley) Ltd
Cramic Aircraft Components Ltd
Elgar Machine Tool Co Ltd
Gear Grinding Co Ltd, The
Leytonstone Jig & Tool Co Ltd
Metachemical Processes Ltd
Mollart Engineering Co Ltd, The
Morfax Ltd
Portsmouth Aviation Ltd
Simon Engineering Dudley Ltd
Taylor, Taylor & Hobson
Villiers (Tool Developments) Ltd

MAGNESIUM AND ITS ALLOYS

Birmetals Ltd
Booth Aluminium Ltd, James
High Duty Alloys Ltd
Magnesium Elektron Ltd
Mills Ltd, William
Stone & Co (Charlton) Ltd, J.
Wilson & Sons (Charlton) Ltd, W.
Wilson Alloys Ltd

MAGNETOS

Associated Electrical Industries Ltd (Motor & Control Gear Division)
Rotax Ltd

MAPS

Foldex Ltd
Hunting Surveys Ltd
International Aeradio Ltd
Meridian Airmaps Ltd

Silicone grease in aerosol container, by Amber Oils Ltd

MARINE AIRCRAFT SERVICING EQUIPMENT

I.V. Pressure Controllers Ltd

MARINE CRAFT

Brooklands Aviation Ltd
Dunlop Rubber Co Ltd
Fairey Marine Ltd
Jablo Propellers Ltd
Miles Marine & Structural Plastics Ltd
Saro (Anglesey) Ltd
Vosper Ltd

MARKERS, RUNWAY

Aeronautical Trades & Manufacturing Co Ltd
Precision Forgings Ltd
Redifon Ltd

MATTING, WING WALKWAY

Latex Upholstery Ltd
Palmer Aero Products Ltd

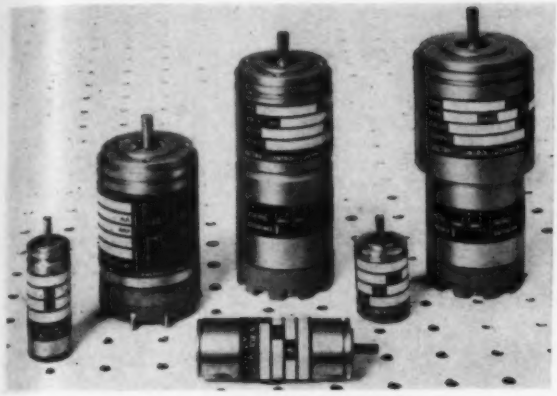
MECHANICAL HANDLING EQUIPMENT

(other than Handling equipment, aircraft; Tractors; and Trucks)

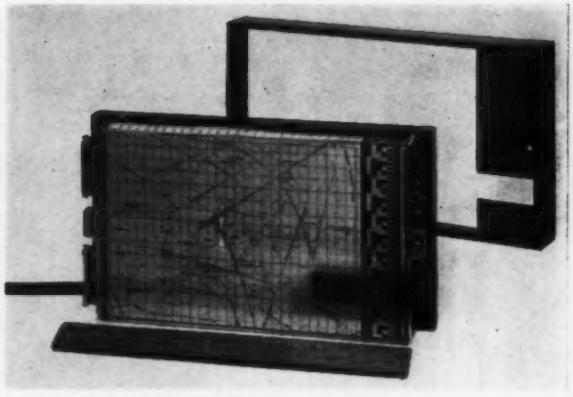
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Aviation Traders (Engineering) Ltd
British MonoRail Ltd
Didsbury Engineering Co Ltd
Electro-Hydraulics Ltd

[*Continued opposite*

ADDRESSES OF COMPANIES: pages 349-355



Miniature d.c., a.c. and tacho-generator motors by Vactric



Decca Navigator self-setting Flight Log

Heston Aircraft & Associated Engineers Ltd
Hydraulics & Pneumatics Ltd
Hymatic Engineering Co Ltd, The
Laycock Engineering Ltd
Leytonstone Jig & Tool Co Ltd
Mercury Airfield Equipment Ltd
Mitchell Hydraulics Ltd
Morfax Ltd
Portsmouth Aviation Ltd
Scotney Ltd, Tom M.

MESSAGE TRANSMISSION, PNEUMATIC-TUBE

Dialled Despatches Ltd

METAL DEPOSITION (other than Plating, electro-)

Albright & Wilson (Mfg) Ltd
Harvey & Co (London) Ltd, G. A.
Morfax Ltd
Portsmouth Aviation Ltd
Taylor (Metal Workers) Ltd, C. F.

METAL SPRAYING AND EQUIPMENT

Bramah & Co Ltd, J. R.
Burnley Aircraft Products Ltd
Western Manufacturing (Reading) Ltd

METEOROLOGICAL INSTRUMENTS AND EQUIPMENT

Airtech Ltd
Beme Telecommunications Ltd
Cossor Radar & Electronics Ltd
Decca Radar Ltd
Mechanism Ltd
Munro Ltd, R. W.
Negretti & Zambra Ltd
Whiteley Electrical Radio Co Ltd

MICROPHONES

Airmed Ltd
Amplivox Ltd
Associated Electrical Industries Ltd
Brown Ltd, S. G.
EMI Electronics Ltd
Ericsson Telephones Ltd
Marconi's Wireless Telegraph Co Ltd
Pye Telecommunications Ltd
Standard Telephones & Cables Ltd
Technical Ceramics Ltd
Trix Electronics Ltd
Whiteley Electrical Radio Co Ltd

MISSILE EQUIPMENT—See Guided-weapon equipment

MODELS, DISPLAY AND WIND TUNNEL, ETC

Airfix Products Ltd
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Bristol Aircraft Ltd
British Oxygen Co Ltd
Burgess & Co Ltd, G. N.
Hunting Surveys Ltd
Industrial Leather Products Ltd
Lucas Gas Turbine Equipment Ltd
Mastermodels Ltd
Meridian Airmaps Ltd
Morfax Ltd
Portsmouth Aviation Ltd
Shawcraft (Models) Ltd
T.E.M. Engineering Ltd
Taylor (Metal Workers) Ltd, C. F.
Taylor (Plastics) Ltd, C. F.
Westway Models Ltd

MOTORS, ELECTRIC

Associated Electrical Industries (Motor and Control Gear Division)
Brown Ltd, S. G.
de Havilland Aircraft Co Ltd, The
English Electric Co Ltd, The
General Electric Co Ltd, The
Newmark Ltd, Louis
Petbow Ltd (Liverpool Works)
Plessey Co Ltd, The
Pullin & Co Ltd, R. B.
Rotax Ltd
SPE Co Ltd
Specto Ltd
Teddington Aircraft Controls Ltd
Vactric Control Equipment Ltd

MOUNTINGS, SHOCK-ABSORBING

Avon India Rubber Co Ltd, The
Bristol Aircraft Ltd
Cementation (Muffelite) Ltd
Delaney Gallay Ltd
Fairey Air Surveys Ltd
Lockheed Precision Products Ltd
Northern Rubber Co Ltd, The
Palmer Aero Products Ltd
Peradin Rubber Co Ltd, T.
Precision Rubbers Ltd
Silentbloc Ltd
Wilmot Mansour Ltd

MUFFLERS, GROUND, FOR JET ENGINES

Auto Diesels Ltd
Cullum & Co Ltd, Horace
Cullum Detuners Ltd
Flight Refuelling Ltd

NAMEPLATES AND LABELS (INCLUDING REPRODUCTION PROCESSES)

Aviation Traders (Engineering) Ltd
Bristol Aeroplane Plastics Ltd
Bristol Aircraft Ltd
C & N (Electrical) Ltd
Coin Insulation Ltd
Formica Ltd
Grundy & Partners Ltd
Kodak Ltd
Miller Aviation Ltd
R.H. Lighting Ltd
Renamel (A.I.D.) Ltd
Vosper Ltd

NAVIGATION AIDS

Cossor Radar & Electronics Ltd
Decca Navigator Co Ltd
Decca Radar Ltd
Ekco Electronics Ltd
English Electric Aviation Ltd (Guided Weapons Division)
Ferranti Ltd
Marconi's Wireless Telegraph Co Ltd
Miles Engineering Ltd, F. G.
Murphy Radio Ltd
Plessey Co Ltd, The
Pye Telecommunications Ltd
Redifon Ltd
Specto Ltd
Sperry Gyroscope Co Ltd
Standard Telephones & Cables Ltd
W.S. Electronics Ltd

NAVIGATIONAL INSTRUMENTS, OTHER THAN RADIO AND RADAR

English Electric Aviation Ltd (Guided Weapons Division)
Ferranti Ltd
Sangamo Weston Ltd
Smiths Aviation Division

NEOPRENE

Avon India Rubber Co Ltd, The
Coin Insulation Ltd
Hall & Hall Ltd
Kautex Ltd
Miles Marine & Structural Plastics Ltd
Northern Rubber Co Ltd, The
Precision Rubbers Ltd

NICKEL AND NICKEL ALLOYS

Aircraft Materials Ltd
International Nickel Co (Mond) Ltd, The
Macready's Metal Co Ltd
Telcon Metals Ltd
Wiggin & Co Ltd, Henry

NUCLEAR POWER EQUIPMENT

AEI Instrumentation Division
Appleby & Ireland Ltd
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Bristol Aerojet Ltd
Bristol Aircraft Ltd
de Havilland Aircraft Co Ltd, The
de Havilland Engine Co Ltd, The
Fairey Engineering Ltd
Flight Refuelling Ltd
General Radiological Ltd

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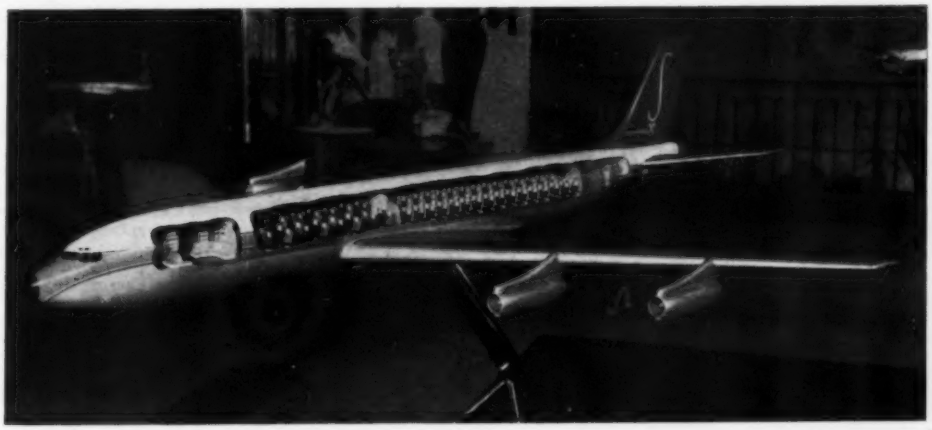


Part-sectioned display model of Boeing 707, to 1/24th scale, by Mastermodels Ltd

Typical Avica pipework component: a 2in twin-gimbal joint

ANCILLARY INDUSTRY 1961...

Hobson Ltd, H. M.
Marston Excelsior Ltd
Miles Hivolt Ltd
Mullard Equipment Ltd
Normalair Ltd
Plessey Nucleonics Ltd
Rolls-Royce Ltd
Salford Electrical Instruments Ltd
Teddington Aircraft Controls Ltd
Ultra Electronics Ltd

NUTS—See A.G.S. parts, also Locknuts

OFFICE EQUIPMENT
Harvey & Co (London) Ltd, G. A.

OIL COOLERS
Delaney Gallay Ltd
English Electric Co Ltd, The
Marston Excelsior Ltd
Serck Radiators Ltd
Vandyke Engineering Ltd

OPTICAL ELEMENTS
Avimo Ltd
Specto Ltd
Taylor, Taylor & Hobson

OVERHAUL, ENGINE—See Servicing

OXYGEN AND/OR EQUIPMENT
Airmed Ltd
Astralux Ltd
Bristol Aerojet Ltd
British Oxygen Aviation Services
Chesterfield Tube Co Ltd, The
Hymatic Engineering Co Ltd, The
I.V. Pressure Controllers Ltd
Kidde Co Ltd, The Walter
Normalair Ltd
Palmer Aero Products Ltd
Siebe, Gorman & Co Ltd

PACKAGING, DESIGN, DEVELOPMENT AND TESTING
E.P.S. (Research & Development) Ltd
Export Packing Service Ltd
Heston Aircraft & Associated Engineers Ltd
Lep Transport Ltd
M.L. Aviation Co Ltd
Microcell Ltd
Reynolds (Packaging) Ltd
Salter & Co Ltd, Geo
Scotney Ltd, Tom M.
Taylor (Metal Workers) Ltd, C. F.
Taylor (Plastics) Ltd, C. F.
Wilmot Mansour Ltd

PACKAGING EQUIPMENT
Avon India Rubber Co Ltd, The
Export Packing Service Ltd
Heston Aircraft & Associated Engineers Ltd
Jablo Propellers Ltd
Reynolds (Packaging) Ltd

PACKAGING, PRESERVATION AND DISPATCH
Bristol Aircraft Ltd
Export Packing Service Ltd
Jablo Propellers Ltd
Lep Transport Ltd
Park Ltd, R. & J.
Reynolds (Packaging) Ltd
Salter & Co Ltd, Geo
Scotney Ltd, Tom M.
Wilmot Mansour Ltd

PACKINGS—See Jointing Materials, Seals, Gaskets

PAINT REMOVERS
Brent Chemical Products Ltd
British Paints Ltd
Cellon Ltd
Docker Bros
Hall & Sons (Bristol & London) Ltd, John
Imperial Chemical Industries Ltd
Laporte Chemicals Ltd
Titanine Ltd
Valay Industries Ltd

PAINTS, OTHER THAN AIRCRAFT FINISHES AND PROTECTIVE PROCESSES
British Paints Ltd
Cellon Ltd
Cox Bros & Co (Derby) Ltd
Docker Bros
Ericsson Telephones Ltd
Hall & Sons (Bristol & London) Ltd, John
Imperial Chemical Industries Ltd
Titanine Ltd

PARACHUTES, AIRCREW
G.Q. Parachute Co Ltd
Irving Air Chute of Great Britain Ltd
Lea Bridge Industries Ltd
Mayday Equipment Ltd

PARACHUTES, SPECIAL-PURPOSE, OTHER THAN AIRCREW
G.Q. Parachute Co Ltd
Irving Air Chute of Great Britain Ltd
Lea Bridge Industries Ltd
Mayday Equipment Ltd

PARACHUTE ACCESSORIES
Aircraft Materials Ltd
G.Q. Parachute Co Ltd
Irving Air Chute of Great Britain Ltd
M.L. Aviation Co Ltd
Redwing Ltd

PARTS, MACHINED
(See also Components, Tubular components, etc)
Aircraft Materials Ltd
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Aviation Traders (Engineering) Ltd
Bell Precision Engineering Co Ltd
Birkett, Billington & Newton Ltd, T. M.
Boulton Paul Aircraft Ltd
British Oxygen Co Ltd
Brooklands Aviation Ltd
Brown Bros (Aircraft) Ltd
Burnley Aircraft Products Ltd
Burgess & Co Ltd, G. N.
CJC Developments (Portsmouth) Ltd
C.W.C. Equipment Ltd
Coin Insulation Ltd
Didsbury Engineering Co Ltd
Henshall & Sons (Addlestone) Ltd, W.
Lancefield Aircraft Components Ltd
Leytonstone Jig & Tool Co Ltd
Marston Excelsior Ltd
Mitchell Hydraulics Ltd
Morfax Ltd
R.F.D. Co Ltd
R.M.R. Engineering
Redwing Ltd
Rubery Owen & Co Ltd
Scottish Aviation Ltd
Spa Guilds Ltd
Villiers (Tool Developments) Ltd
Yorkshire Engineering Supplies Ltd

PARTS, TUBULAR
Accles & Pollock Ltd
Aviation Traders (Engineering) Ltd
Henshall & Sons (Addlestone) Ltd, W.
Hickman Ltd
Lancefield Aircraft Components Ltd
Middleton Sheet Metal Co Ltd
Morfax Ltd
R.M.R. Engineering
Reynolds Tube Co Ltd
Samlesbury Engineering Ltd

PASSENGER PERSONAL EQUIPMENT
British Oxygen Aviation Services
Industrial Leather Products Ltd
Lancefield Aircraft Components Ltd

PATTERNS, CASTING
Birkett, Billington & Newton Ltd, T. M.
Boulton Paul Aircraft Ltd
Gloster Engineering (Cheltenham) Ltd
Mastermodels Ltd
Taylor (Plastics) Ltd, C. F.

PHOTO-COPYING
Aviation Traders (Engineering) Ltd
Harringay Photographic & Electrical Supplies Ltd
Hunting Surveys Ltd
Meridian Airmaps Ltd
Technical Platings Ltd
Whittemore (Aeradio) Ltd, A. J.

PHOTO-COPYING EQUIPMENT
EMI Electronics Ltd
Fairey Air Surveys Ltd
Harringay Photographic & Electrical Supplies Ltd
Kodak Ltd
R.H. Lighting Ltd
Redwing Ltd
Williamson Manufacturing Co Ltd

PHOTOGRAMMETRIC EQUIPMENT
Fairey Air Surveys Ltd
Harringay Photographic & Electrical Supplies Ltd
Williamson Manufacturing Co Ltd

PHOTOGRAPHIC MATERIALS AND EQUIPMENT
Direct Photographic Supplies Ltd
Harringay Photographic & Electrical Supplies Ltd
Ilford Ltd
Kodak Ltd
Laporte Chemicals Ltd
Specto Ltd
Taylor, Taylor & Hobson
Vinten Ltd, W.
Williamson Manufacturing Co Ltd

PHOTOGRAPHY, GENERAL
Aviation Traders (Engineering) Ltd
Direct Photographic Supplies Ltd
Fairey Air Surveys Ltd
Gloster Aircraft Co Ltd
Harringay Photographic & Electrical Supplies Ltd
Hunting Surveys Ltd
Meridian Airmaps Ltd

PIPEWORK, FABRICATED
Aviation Traders (Engineering) Ltd
Avica Equipment Ltd
Baxter, Woodhouse & Taylor Ltd
Bramah & Co Ltd, J. R.
Bristol Aerojet Ltd
Burnley Aircraft Products Ltd
Harvey & Co (London) Ltd, G. A.
High Pressure Components Ltd
King Aircraft Corporation
Lancefield Aircraft Components Ltd
Marston Excelsior Ltd
Middleton Sheet Metal Co Ltd
Morfax Ltd
Palmer Aero Products Ltd
Simmons & Hawker Ltd
Skyways Ltd

PIEZO-ELECTRIC MATERIALS
Salford Electrical Instruments Ltd
Standard Telephones & Cables Ltd
Technical Ceramics Ltd

PISTONS AND RINGS
Cross Manufacturing Co (1938) Ltd
Hepworth & Grandage (Yeadon) Ltd
Wellworthy Ltd

PLASTIC METAL FILLERS
Aircraft Materials Ltd
Kane (Sealants) Ltd, Douglas
Kenilworth Manufacturing Co Ltd, The

PLASTICS, EXPANDED
Avon India Rubber Co Ltd, The
Jablo Propellers Ltd
Taylor (Plastics) Ltd, C. F.
Thermo-Plastics Ltd

PLASTICS, EXTRUSIONS
AEI Radio & Electronic Components Division
Formica Ltd
Heliermann Ltd
Jablo Propellers Ltd
Suntex Safety Glass Industries Ltd
Ward, Brooke & Co Ltd
Wills Pressure Filled Joint Ring Ltd

PLASTICS, FABRICATED
Aerogalley Ltd
Aston & Co Ltd, E. S.
Attewell & Sons Ltd, B.
Bristol Aeroplane Plastics Ltd
C.W.C. Equipment Ltd
Coin Insulation Ltd
English Electric Aviation Ltd (Guided Weapons Division)
English Electric Co Ltd, The
Guest Keen & Nettlefolds (Midlands) Ltd
Hordern Richmond Ltd
Industrial Leather Products Ltd
Jablo Propellers Ltd
Lancefield Aircraft Components Ltd
M.L. Aviation Co Ltd
Marston Excelsior Ltd
Mastermodels Ltd
Miles Marine & Structural Plastics Ltd
Parnall & Co Ltd, George
Saro (Anglesey) Ltd
Suntex Safety Glass Industries Ltd
Taylor (Plastics) Ltd, C. F.
Thermo-Plastics Ltd
Ward, Brooke & Co Ltd
Williamson & Son Ltd, Jas.
Wills Pressure Filled Joint Ring Ltd

PLASTICS, GLASS FIBRE
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Bristol Aerojet Ltd
Bristol Aeroplane Plastics Ltd
Brooklands Aviation Ltd
Chelton (Electrostatics) Ltd
Coin Insulation Ltd
de Havilland Aircraft Co Ltd, The
English Electric Aviation Ltd (Guided Weapons Division)
English Electric Co Ltd, The
Fibreglass Ltd
Fothergill & Harvey Ltd
Jablo Propellers Ltd
Kidde Co Ltd, The Walter
Mastermodels Ltd
Microcell Ltd
Miles Marine & Structural Plastics Ltd
Samlesbury Engineering Ltd
Saro (Anglesey) Ltd
T.E.M. Engineering Ltd
Taylor (Plastics) Ltd, C. F.
Thermo-Plastics Ltd
Ward, Brooke & Co Ltd

PLASTICS, LAMINATED
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Bakelite Ltd
Bristol Aeroplane Plastics Ltd
Coin Insulation Ltd

[Continued on page 343

ADDRESSES OF COMPANIES: pages 349-355

MARCONI

sixty series

. . . a new generation of airadio equipment

DESIGN FOR RELIABILITY

AD 160 VHF COMMUNICATION
AD 260 VHF NAVIGATION
AD 360 AUTOMATIC DIRECTION FINDING

MARCONI *sixty series*

SPECIFIED BY
B.O.A.C. FOR VICKERS VC. 10
B.E.A. FOR D.H. TRIDENT

MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED, CHELMSFORD, ESSEX, ENGLAND

A10

Honeywell's new monitoring technique for electronic systems is a great simplifier.
At a time when aircraft 'black box' components are becoming more complex . . .
more difficult to check for faults . . .
more demanding of time and insight from highly trained engineers,
the Automatic Systems Analyser—

DOES ALL THE TESTING
electronic systems are checked individually and while working together . . .
all automatically at flight line level.

DOES IT QUICKLY
at a check rate of one test per second, the Analyser cuts aircraft down time.

DOES IT ACCURATELY
the Analyser even checks itself for error while it is testing the aircraft.

DOES IT WITH LESS MANPOWER
essential skills are built into the Analyser; fewer men with less training are needed on aircraft maintenance.

Honeywell's Automatic Systems Analyser simplifies servicing wherever it is used.
It is a major advance in methods for increasing the operational efficiency of today's electronically complex aircraft.

Be sure to see Honeywell on Stand 292 Farnborough

Honeywell Automatic Systems Analyser

simplifies aircraft 'check-out'

Honeywell Controls Limited
Greenford Middlesex
Waxlow 2333

Honeywell

Aeronautical Division

ANCILLARY INDUSTRY 1961...

Darchem Engineering Ltd
English Electric Aviation Ltd (Guided Weapons Division)
English Electric Co Ltd, The
Formica Ltd
Gloster Engineering (Cheltenham) Ltd
Heston Aircraft & Associated Engineers Ltd
Hordern Richmond Ltd
Jablo Propellers Ltd
Marston Excelsior Ltd
Micanite & Insulators Co Ltd, The
Microcell Ltd
Miles Marine & Structural Plastics Ltd
Saro (Anglesey) Ltd
T.E.M. Engineering Ltd
Taylor (Metal Workers) Ltd, C. F.
Taylor (Plastics) Ltd, C. F.
Thermo-Plastics Ltd
Tufnol Ltd

PLASTICS, MOULDED

AEI Plastics (Aldridge) Ltd
Aerogalley Ltd
Airfix Products Ltd
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Attewell & Sons Ltd, B.
Bristol Aeroplane Plastics Ltd
Brooklands Aviation Ltd
C.W.C. Equipment Ltd
Chelton (Electrostatics) Ltd
Coin Insulation Ltd
Cornercroft Ltd
de Havilland Aircraft Co Ltd, The
English Electric Co Ltd, The
Ericsson Telephones Ltd
Girdlestone Pumps Ltd
Gloster Engineering (Cheltenham) Ltd
Hawley Products Ltd
Hellermann Ltd
Heston Aircraft & Associated Engineers Ltd
Industrial Leather Products Ltd
Leytonstone Jig & Tool Co Ltd
M.B. Metals Ltd
Mastermodels Ltd
Microcell Ltd
Miles Marine & Structural Plastics Ltd
Portsmouth Aviation Ltd
Suntex Safety Glass Industries Ltd
Taylor (Plastics) Ltd, C. F.
Thermo-Plastics Ltd
Turner Electrical Instruments Ltd, Ernest
Ward, Brooke & Co Ltd
Whiteley Electrical Radio Co Ltd
Wills Pressure Filled Joint Ring Ltd

PLASTICS, RAW MATERIALS

Bakelite Ltd
CIBA (A.R.L.) Ltd
Coin Insulation Ltd
Imperial Chemical Industries Ltd
Laporte Chemicals Ltd
Monsanto Chemicals Ltd
Turner Bros Asbestos Co Ltd

PLASTICS, SHEETING

AEI Radio & Electronic Components Division
Bakelite Ltd
Brand & Co Ltd, R. A.
Coin Insulation Ltd
Hordern Richmond Ltd
I.C.I. (Hyde) Ltd
Imperial Chemical Industries Ltd
Lancefield Aircraft Components Ltd
Micanite & Insulators Co Ltd, The
Scotney Ltd, Tom M.
Thermo-Plastics Ltd
Tufnol Ltd
Williamson & Son Ltd, Jas.
Wills Pressure Filled Joint Ring Ltd

PLATING, CHEMICAL

Albright & Wilson (Mfg) Ltd
C & N (Electrical) Ltd
Fairey Marine Ltd
Hycrome Ltd
Metachemical Processes Ltd

PLATING, ELECTRO—See Deposition

PLATING EQUIPMENT, ELECTRO-

Metachemical Processes Ltd
Partridge, Wilson & Co Ltd
Standard Telephones & Cables Ltd
Westinghouse Brake & Signal Co Ltd

PLUGS, SPARKING AND IGNITER

Bosch Ltd
Lodge Plugs Ltd
Smiths Aviation Division

PLYWOOD

Jablo Propellers Ltd
Mallinson & Sons Ltd, William

PNEUMATIC SYSTEMS

AEI Instrumentation Division
Aircraft Materials Ltd
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Armstrong Whitworth Equipment
Desoutter Bros Ltd
Dunlop Rubber Co Ltd
Electro-Hydraulics Ltd
Hydraulics & Pneumatics Ltd
Hymatic Engineering Co Ltd, The
I.V. Pressure Controllers Ltd
Palmer Aero Products Ltd
Plessey Co Ltd, The
Teddington Aircraft Controls Ltd
Williams & James (Engineers) Ltd

PRESSURE VESSELS

Bramah & Co Ltd, J. R.
British Oxygen Aviation Services
Chesterfield Tube Co Ltd, The
English Steel Forge & Engineering Corporation Ltd
Firth & John Brown Ltd, Thos.
Hadfields Ltd
Harvey & Co (London) Ltd, G. A.
Marston Excelsior Ltd
Middleton Sheet Metal Co Ltd
Morfax Ltd
R.F.D. Co Ltd
Reynolds Tube Co Ltd
Saro (Anglesey) Ltd
Simmons & Hawker Ltd
Taylor (Metal Workers) Ltd, C. F.
Taylor (Plastics) Ltd, C. F.

PRESSURIZATION EQUIPMENT—See Air Conditioning

PRESSWORK

Abbey Panel & Sheet Metal Co Ltd
Attewell & Sons Ltd, B.
Autoset (Production) Ltd
Aviation Traders (Engineering) Ltd
Boulton Paul Aircraft Ltd
Bramah & Co Ltd, J. R.
Brooklands Aviation Ltd
Burnley Aircraft Products Ltd
Cornercroft Ltd
Heston Aircraft & Associated Engineers Ltd
Jablo Propellers Ltd
Lancefield Aircraft Components Ltd
Laycock Engineering Ltd
Leytonstone Jig & Tool Co Ltd
Middleton Sheet Metal Co Ltd
Miles Marine & Structural Plastics Ltd
Morfax Ltd
R.F.D. Co Ltd
Ratcliffe (Rochdale) Ltd, F. S.
Redwing Ltd
Riley Ltd, Robert
Ross, Courtney & Co Ltd
Saro (Anglesey) Ltd
Smith Ltd, Herman
Steel Stampings Ltd
Taylor (Metal Workers) Ltd, C. F.
Terry & Sons Ltd, Herbert
Thompson (Engineers) Ltd, Raymond F.
V.P. Sheet Metal Ltd
Western Manufacturing (Reading) Ltd

PRINTED CIRCUITS

Armstrong Whitworth Aircraft Ltd, Sir W. G.
Armstrong Whitworth Equipment
Associated Electrical Industries Ltd
Blackburn Aircraft Ltd
Coin Insulation Ltd
Cossor Radar & Electronics Ltd
Ericsson Telephones Ltd
Ferranti Ltd
Grundy & Partners Ltd
Kodak Ltd
McMichael Radio Ltd
Newmark Ltd, Louis
Plessey Co Ltd, The
Salford Electrical Instruments Ltd
Short Bros & Harland Ltd
Technograph Electronics Products Ltd
Ultra Electronics Ltd
Whiteley Electrical Radio Co Ltd

Lucas gas-turbine fuel pump. A typical unit of this GP.200 type feeds 200gal/hr/1,000 r.p.m. at 1,250lb/sq in and weighs about 3¾lb

PRINTING, TECHNICAL AND GENERAL

Bristol Aircraft Ltd
International Aeradio Ltd
Orchard & Ind Ltd

PROPELLERS AND ASSOCIATED EQUIPMENT

Aircraft & General Finance Corporation Ltd
Airscrew Co & Jicwood Ltd, The
de Havilland Aircraft Co Ltd, The
Dowty Rotol Ltd
Hordern Richmond Ltd
Morfax Ltd

PROTECTIVE PROCESSES (OTHER THAN AIRCRAFT FINISHES)

Brand & Co Ltd, R. A.
Durion Ltd
Goodyear Tyre & Rubber Co (Great Britain) Ltd
Hellermann Ltd
Imperial Chemical Industries Ltd
Laporte Chemicals Ltd
Lep Transport Ltd
Metachemical Processes Ltd
Stuart (London) Ltd, Robert
Valay Industries Ltd
Walterisation Co Ltd, The

PUBLIC ADDRESS EQUIPMENT, AIRBORNE

Murphy Radio Ltd
Redifon Ltd
Standard Telephones & Cables Ltd
Trix Electronics Ltd
Ultra Electronics Ltd

PUBLIC ADDRESS EQUIPMENT, GROUND

AEI Telecommunications Division
Associated Electrical Industries Ltd
Beme Telecommunications Ltd
General Electric Co Ltd, The
Murphy Radio Ltd
Standard Telephones & Cables Ltd
Trix Electronics Ltd
Whiteley Electrical Radio Co Ltd

PUBLICATIONS, TECHNICAL AND GENERAL

Associated Electrical Industries Ltd (Motor & Control Gear Division)
Associated Iliffe Press Ltd
Bell & Sons Ltd, G.
Cassell & Co Ltd
Harleyford Publications Ltd
Heinemann Ltd, William
Heywood & Co Ltd
Hodder & Stoughton Ltd
Hutchinson & Co (Publishers) Ltd
International Aeradio Ltd
Jarrolds Publishers (London) Ltd
Newnes Ltd, George
Pitman & Sons Ltd, Sir Isaac
Putnam & Co Ltd
Sampson Low, Marston & Co Ltd
Secker & Warburg
Smith & Son, W. H.

PUMPS, AIR PRESSURE AND VACUUM

British Oxygen Aviation Services
Dunlop Rubber Co Ltd
Godfrey & Partners Ltd, Sir George
Hydraulics & Pneumatics Ltd
Hymatic Engineering Co Ltd, The
Plessey Co Ltd, The
Williams & James (Engineers) Ltd

PUMPS, FUEL AND OIL

Hobson Ltd, H. M.
Lucas Gas Turbine Equipment Ltd
Plessey Co Ltd, The
Power Flexible Tubing Co Ltd
Rover Gas Turbines Ltd
SPE Co Ltd
Tecalemit Ltd
Villiers (Tool Developments) Ltd
Wayne Tank & Pump Co Ltd
Zwicky Ltd

PUMPS, HYDRAULIC

Boulton Paul Aircraft Ltd
Dowty Rotol Ltd
Electro-Hydraulics Ltd
Exactor Ltd
Fairey Engineering Ltd
Hobson Ltd, H. M.
Hydraulics & Pneumatics Ltd
Integral Ltd
Lockheed Precision Products Ltd
Lucas Gas Turbine Equipment Ltd
Plessey Co Ltd, The
SPE Co Ltd
Short Bros & Harland Ltd
Sperry Gyroscope Co Ltd
Villiers (Tool Developments) Ltd
Wilmot Breeden Ltd
Zwicky Ltd

PYROTECHNICS

Portsmouth Aviation Ltd
Schermuly Pistol Rocket Apparatus Ltd, The
WAECO Ltd, Marine Division (Air/Sea Rescue)

RACKING

Aviation Traders (Engineering) Ltd
Harvey & Co (London) Ltd, G. A.
Imhof Ltd, Alfred
Smiths Aviation Division
Whittemore (Aeradio) Ltd, A. J.

RADAR EQUIPMENT AND COMPONENTS

Associated Electrical Industries Ltd
Autoset (Production) Ltd
Bradley Ltd, G. & E.
Bristol Aeroplane Plastics Ltd
Cossor Radar & Electronics Ltd
Decca Radar Ltd
EMI Electronics Ltd
Ekco Electronics Ltd
Elliott Bros (London) Ltd
Ferranti Ltd
Handley Page Ltd
Heston Aircraft & Associated Engineers Ltd
Lancefield Aircraft Components Ltd
McMichael Radio Ltd
Marconi's Wireless Telegraph Co Ltd
Marston Excelsior Ltd
Miles Engineering Ltd, F. G.
Morfax Ltd
Mullard Equipment Ltd
Murphy Radio Ltd
Plessey Co Ltd, The
Sanders (Electronics) Ltd, W. H.

[*Continued overleaf*

ADDRESSES OF COMPANIES: pages 349-355

Cossor SSR.4G secondary radar ground equipment under evaluation at London Airport by the MoA

ANCILLARY INDUSTRY 1961...

Standard Telephones & Cables Ltd
Taylor (Plastics) Ltd, C. F.
Thermo-Plastics Ltd
Vandyke Engineering Ltd
Whiteley Electrical Radio Co Ltd

RADIO EQUIPMENT AND COMPONENTS

AEI Radio & Electronic Components Division
Airmed Ltd
Airtech Ltd
Beme Telecommunications Ltd
Bradley Ltd, G. & E.
British Communications Corporation Ltd
Brush Crystal Co Ltd
Burndept Ltd
Cossor Communications Co Ltd
Cossor Radar & Electronics Ltd
Ekco Electronics Ltd
Elliott Bros (London) Ltd
McMichael Radio Ltd
Marconi's Wireless Telegraph Co Ltd
Mullard Equipment Ltd
Murphy Radio Ltd
Plessey Co Ltd, The
Pye Telecommunications Ltd
Racal Engineering Ltd
Redifon Ltd
Standard Telephones & Cables Ltd
Thermo-Plastics Ltd
Ultra Electronics Ltd
W.S. Electronics Ltd
Wayne Kerr Laboratories Ltd
Whiteley Electrical Radio Co Ltd
Z & I Aero Services Ltd

RADIO NAVIGATIONAL EQUIPMENT

Beme Telecommunications Ltd
Bradley Ltd, G. & E.
Cossor Radar & Electronics Ltd
Decca Navigator Co Ltd
Decca Radar Ltd
Ekco Electronics Ltd
Elliott Bros (London) Ltd
McMichael Radio Ltd
Marconi's Wireless Telegraph Co Ltd
Mullard Equipment Ltd
Murphy Radio Ltd
Plessey Co Ltd, The
Pye Telecommunications Ltd
Redifon Ltd
Standard Telephones & Cables Ltd
W.S. Electronics Ltd

RADIO AND RADAR INSTALLATIONS, PLANNING AND SUPPLY OF

Aero Electronics Ltd
Airwork Services Ltd
Associated Electrical Industries Ltd
Aviation Traders (Engineering) Ltd
Boulton Paul Aircraft Ltd
Cossor Radar & Electronics Ltd
Curran Ltd, John
Decca Radar Ltd
EMI Electronics Ltd
Ekco Electronics Ltd
International Aeradio Ltd
Lancefield Aircraft Components Ltd
McAlpine Aviation
Marconi's Wireless Telegraph Co Ltd.
Mullard Equipment Ltd
Murphy Radio Ltd
Plessey Co Ltd, The
Pye Telecommunications Ltd
Sanders (Electronics) Ltd, W. H.
Standard Telephones & Cables Ltd
Whittemore (Aeradio) Ltd, A. J.

RADIOGRAPHY AND X-RAY EQUIPMENT

Ilford Ltd
Kent Alloys Ltd
Kodak Ltd
Marconi Instruments Ltd
Middleton Sheet Metal Co Ltd
Miles Hivolt Ltd
Mullard Equipment Ltd
Palmer Aero Products Ltd
Skyways Ltd
Solus-Schall Ltd

RADOMES

Armstrong Whitworth Aircraft Ltd, Sir W. G.
Bristol Aeroplane Plastics Ltd
Fairey Marine Ltd
Gloster Aircraft Co Ltd
Jablo Propellers Ltd
Leytonstone Jig & Tool Co Ltd
Marconi's Wireless Telegraph Co Ltd
Marston Excelsior Ltd
Microcell Ltd
Miles Marine & Structural Plastics Ltd
R.F.D. Co Ltd
Saro (Anglesey) Ltd
Taylor (Metal Workers) Ltd, C. F.
Taylor (Plastics) Ltd, C. F.
Thermo-Plastics Ltd

RAMPS, VEHICLE, LOADING, ETC

Armstrong Whitworth Equipment
Aviation Traders (Engineering) Ltd
Bristol Aircraft Ltd
Heston Aircraft & Associated Engineers Ltd
R.F.D. Co Ltd
Taylor (Plastics) Ltd, C. F.

RECORDERS, SOUND

EMI Electronics Ltd
Specto Ltd
Thermionic Products (Electronics) Ltd

RECTIFIERS

Bradley Ltd, G. & E.
English Electric Co Ltd, The
English Electric Valve Co Ltd
Ferranti Ltd
General Electric Co Ltd, The
Mullard Ltd
Partridge, Wilson & Co Ltd
Plessey Co Ltd, The
Salford Electrical Instruments Ltd
Standard Telephones & Cables Ltd
Texas Instruments Ltd
Westinghouse Brake & Signal Co Ltd

REFRACTORY MATERIALS

Bell's Asbestos & Engineering Ltd
Darchem Engineering Ltd
Steatite & Porcelain Products Ltd

REFUELLERS—See Fuelling equipment

RELAYS, ELECTRICAL

AEI Instrumentation Division
AEI Telecommunications Division
Astralux Ltd
C.W.C. Equipment Ltd
Clare Ltd, C. P.
"Diamond H" Switches Ltd
English Electric Co Ltd, The
Ericsson Telephones Ltd
Ferranti Ltd
General Electric Co Ltd, The
Hendrey Relays Ltd
Muirhead & Co Ltd
Newmark Ltd, Louis
Page Engineering Co (Sunbury on Thames) Ltd
Plessey Co Ltd, The
Pullin & Co Ltd, R. B.
Rotax Ltd
Sangamo Weston Ltd
Smiths Aviation Division
Standard Telephones & Cables Ltd
Thorn Electrical Industries Ltd
Western Manufacturing (Reading) Ltd

RELEASES, PARACHUTE, DROP TANK, ETC

Aircraft Materials Ltd
Blackburn Aircraft Ltd
Brooklands Aviation Ltd
G.Q. Parachute Co Ltd
Hymatic Engineering Co Ltd, The
Irving Air Chute of Great Britain Ltd
Miles Engineering Ltd, F. G.
Redwing Ltd

RESINS, SYNTHETIC

Bakelite Ltd
Beck, Koller & Co (England) Ltd
CIBA (A.R.L.) Ltd
Imperial Chemical Industries Ltd
Kane (Sealants) Ltd, Douglas
Microcell Ltd
Miles Marine & Structural Plastics Ltd
Monsanto Chemicals Ltd
United Coke & Chemicals Co Ltd
United Steel Companies Ltd, The

RESISTORS

Astralux Ltd
Muirhead & Co Ltd
Mullard Ltd
Plessey Co Ltd, The
Rotax Ltd
Standard Telephones & Cables Ltd
Texas Instruments Ltd

RHEOSTATS

Rotax Ltd

RIVETING EQUIPMENT

Aircraft Materials Ltd
Avdel Ltd
Bardolph & Partners Ltd, J. F.
Tucker Eyelet Co Ltd, Geo

RIVETS—See A.G.S. parts

ROCKET PROPULSION UNITS

Bristol Aerojet Ltd
de Havilland Engine Co Ltd, The
Rolls-Royce Ltd

ROLLERS, CONVEYOR

Armstrong Whitworth Aircraft Ltd, Sir W. G.
Avon India Rubber Co Ltd, The

ROPES

British Ropes Ltd

RUBBER CORDS AND RINGS

Avon India Rubber Co Ltd, The
Beldam Asbestos Co Ltd
Bell's Asbestos & Engineering Ltd
Dowty Seals Ltd
Hall & Hall Ltd
Kautex Ltd
Northern Rubber Co Ltd, The
Palmer Aero Products Ltd
Precision Rubbers Ltd

RUBBER, EXPANDED

Avon India Rubber Co Ltd, The
Kautex Ltd
Northern Rubber Co Ltd, The
Palmer Aero Products Ltd
Precision Rubbers Ltd
Ward, Brooke & Co Ltd

RUBBER, GENERAL AND MECHANICAL

(Including synthetic rubbers and bonded components)

Avon India Rubber Co Ltd, The
Bell's Asbestos & Engineering Ltd
Dowty Seals Ltd
Fireproof Tanks Ltd
Firestone Tyre & Rubber Co Ltd
Flexible Ducting Ltd
Hall & Hall Ltd
Imperial Chemical Industries Ltd
Kautex Ltd
Northern Rubber Co Ltd, The
Palmer Aero Products Ltd
Peradin Rubber Co Ltd
Precision Rubbers Ltd
Silentbloc Ltd
Super Oil Seals & Gaskets Ltd
Trist & Co Ltd, Ronald
Walker & Co Ltd, James

RUST REMOVERS AND INHIBITORS

(See also Corrosion inhibitors, Protective processes, etc)

Brent Chemical Products Ltd
Esso Petroleum Co Ltd
Hellermann Ltd
Imperial Chemical Industries Ltd
Laporte Chemicals Ltd
Reynolds (Packaging) Ltd
Walterisation Co Ltd, The

SAFETY EQUIPMENT—See Life-saving equipment

SALVAGE EQUIPMENT, AIRCRAFT

Bristol Aircraft Ltd
Curran Ltd, John
Dunlop Rubber Co Ltd
R.F.D. Co Ltd

SALVAGE OF AIRCRAFT, ETC

Aviation Traders (Engineering) Ltd
Hants & Sussex Aviation Ltd
McAlpine Aviation

SCRAP, COLLECTION AND DISPOSAL OF

Aviation Traders (Engineering) Ltd
Bristol Aircraft Ltd
Coley & Son (Hounslow) Ltd, R. J.
Hants & Sussex Aviation Ltd

AIR TRAFFIC CONTROL

Television can present tabulated flight progress information instantaneously wherever it is required in an air traffic control centre.

TAKE A GOOD VIEW

APRON SURVEILLANCE

Television presents an all-round view of the complete parking area, eliminating the blind spots and enabling the marshalling supervisor to see the number and disposition of aircraft anywhere on the apron.

DATA TRANSMISSION FOR AIR TRAFFIC CONTROL

PASSENGER HANDLING INFORMATION

ARRIVAL/DEPARTURE INFORMATION

FLIGHT SCHEDULE INFORMATION

FLIGHT MOVEMENT INFORMATION

WIND TUNNEL OBSERVATION

MET. BRIEFING

DOCUMENT TRANSMISSION

TRAINING

FLIGHT TESTING

RUNWAY OBSERVATION

APRON SURVEILLANCE

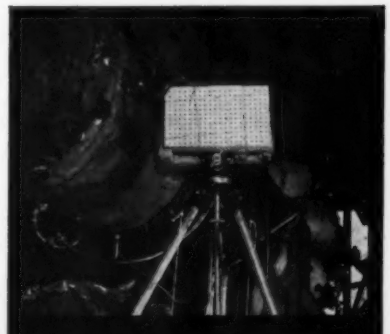
MARCONI

TELEVISION FOR AVIATION

Closed Circuit Television Division

MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED

BASILDON, ESSEX, ENGLAND

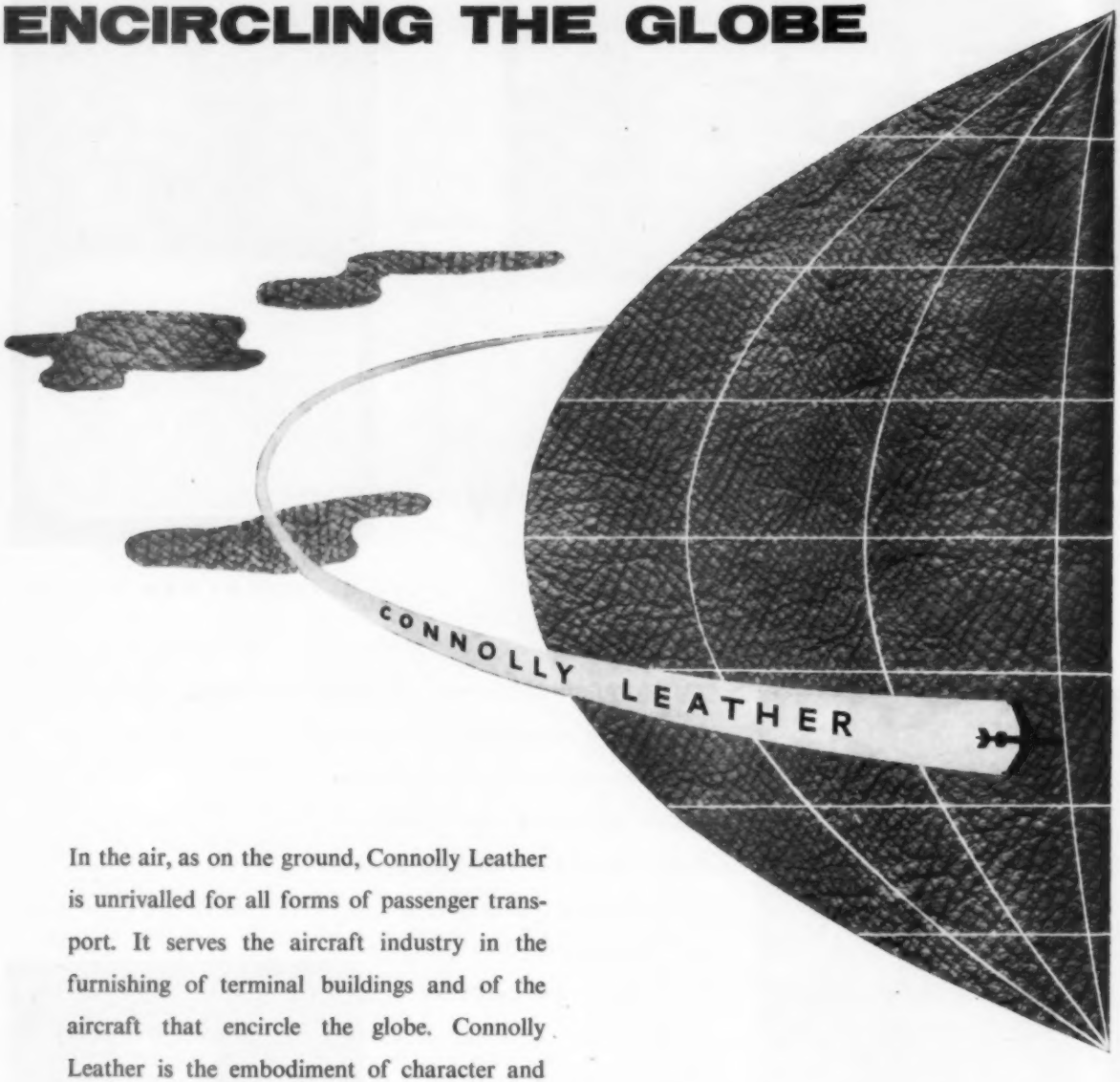


RESEARCH

Observation of after burning in a gas turbine engine at a government research station. This is typical of the many research applications for which television is being used to-day.

c1

ENCIRCLING THE GLOBE



In the air, as on the ground, Connolly Leather is unrivalled for all forms of passenger transport. It serves the aircraft industry in the furnishing of terminal buildings and of the aircraft that encircle the globe. Connolly Leather is the embodiment of character and comfort.

Connolly Leather

S.B.A.C. FLYING DISPLAY
FARNBOROUGH
INDOOR EXHIBITION
STAND No. 18

GIVE GENEROUSLY
R.A.F. BENEVOLENT FUND
67 PORTLAND PLACE
LONDON, W.1.

CONNOLLY BROS. (CURRIERS) LTD., CHALTON STREET, EUSTON ROAD, LONDON, N.W.1. Telephone: EUSTON 1661-5

ANCILLARY INDUSTRY 1961...

SCREWJACKS
Edghill Equipment Ltd
Hobson Ltd, H. M.
Plessey Co Ltd, The
Rotax Ltd
Teleflex Products Ltd

SCREWS—See A.G.S. parts

SEALANTS
Aircraft Materials Ltd
B.B. Chemical Co Ltd
British Paints Ltd
Imperial Chemical Industries Ltd
Kane (Sealants) Ltd, Douglas
Kenilworth Manufacturing Co Ltd, The
Trist & Co Ltd, Ronald
Wellworthy Ltd

SEALANTS, RUNWAY JOINTING
British Paints Ltd

SEALS, MECHANICAL
Avica Equipment Ltd
Avon India Rubber Co Ltd, The
Dowty Seals Ltd
Fireproof Tanks Ltd
Flexibox Ltd
Hall & Hall Ltd
Hydraulics & Pneumatics Ltd
Kane (Sealants) Ltd, Douglas
Palmer Aero Products Ltd
Super Oil Seals & Gaskets Ltd
Trist & Co Ltd, Ronald
Wellworthy Ltd

SEATS, AIRCRAFT
Aircraft Furnishing Ltd
Flight Equipment & Engineering Ltd
Flying Service Engineering & Equipment Ltd
Henshall & Sons (Addlestone) Ltd, W.
Lancefield Aircraft Components Ltd
Latex Upholstery Ltd
Lea Bridge Industries Ltd
M.L. Aviation Co Ltd
Rumbold & Co Ltd, L. A.
Short Bros & Harland Ltd
Transport Seating Ltd
Western Manufacturing (Reading) Ltd

SEATS, EJECTION
Folland Aircraft Ltd
M.L. Aviation Co Ltd
Martin-Baker Aircraft Co Ltd

SEMICONDUCTORS
AEI Radio & Electronic Components Division
Associated Electrical Industries Ltd
Bradley Ltd, G. & E.
Brush Crystal Co Ltd
English Electric Valve Co Ltd
Ferranti Ltd
General Electric Co Ltd, The
Imperial Chemical Industries Ltd
Lucas Ltd, Joseph
Monsanto Chemicals Ltd
Mullard Ltd
Rotax Ltd
Semiconductors Ltd
Sperry Gyroscope Co Ltd
Standard Telephones & Cables Ltd
Stone & Co (Deptford) Ltd, J.
Texas Instruments Ltd
Westinghouse Brake & Signal Co Ltd

SERVICING, REPAIR AND OVERHAUL, AIRFRAME
Airwork Services Ltd
Aviation Traders (Engineering) Ltd
Boulton Paul Aircraft Ltd
British Oxygen Aviation Services
Brooklands Aviation Ltd
Cunard Eagle Airways Ltd
Derby Aviation Ltd
Field Aircraft Services Ltd
Flight Refuelling Ltd
Gloster Aircraft Co Ltd
Hants & Sussex Aviation Ltd
I.V. Pressure Controllers Ltd
McAlpine Aviation
Rollason Aircraft & Engines Ltd
Saywell Ltd, R. F.
Scottish Aviation Ltd
Skyways Ltd
Taylor (Metal Workers) Ltd, C. F.
Universal Flying Services Ltd
Warden Aviation & Engineering Co
Whittemore (Aeradio) Ltd, A. J.

SERVICING, REPAIR AND OVERHAUL, ELECTRICAL
Airtech Ltd
Airwork Services Ltd
Aviation Traders (Engineering) Ltd
Brooklands Aviation Ltd
C & N (Electrical) Ltd
Cunard Eagle Airways Ltd
de Havilland Aircraft Co Ltd, The
Derby Aviation Ltd
Eastern Aero Electrical Services Ltd
Elliott Bros (London) Ltd
Field Aircraft Services Ltd
Flight Refuelling Ltd
Hants & Sussex Aviation Ltd
M.B. Metals Ltd
McAlpine Aviation Ltd
Newton & Co Ltd, H. T.
Plessey Co Ltd, The
R.F.D. Co Ltd
Rotax Ltd
Scottish Aviation Ltd
Skyways Ltd
Staravia Ltd
Vandyke Engineering Ltd
Whiteley Electrical Radio Co Ltd
Whittemore (Aeradio) Ltd, A. J.

SERVICING, REPAIR AND OVERHAUL, ELECTRONIC
Airtech Ltd
Airwork Services Ltd
Aviation Traders (Engineering) Ltd
Bradley Ltd, G. & E.
C & N (Electrical) Ltd
Cossor Radar & Electronics Ltd
de Havilland Aircraft Co Ltd, The
Decca Radar Ltd
Eastern Aero Electrical Services Ltd
Elliott Bros (London) Ltd
Field Aircraft Services Ltd
International Aeradio Ltd
M.B. Metals Ltd
McAlpine Aviation
Newton & Co Ltd, H. T.
Plessey Co Ltd, The
R.F.D. Co Ltd
Racal Engineering Ltd
Redifon Ltd
Savage Ltd, W. Bryan
Staravia Ltd
Vandyke Engineering Ltd
Whiteley Electrical Radio Co Ltd
Whittemore (Aeradio) Ltd, A. J.

SERVICING, REPAIR AND OVERHAUL, ENGINE
Air Engine Services (U.S.-U.K.) Ltd
Airwork Services Ltd
Auto Diesels Ltd
Aviation Traders (Engineering) Ltd
Blackburn Engines Ltd
Brooklands Aviation Ltd
de Havilland Aircraft Co Ltd, The
Derby Aviation Ltd
Field Aircraft Services Ltd
Hants & Sussex Aviation Ltd
Lucas Gas Turbine Equipment Ltd
McAlpine Aviation
Morfax Ltd
Plessey Co Ltd, The
Rollason Aircraft & Engines Ltd
Rolls-Royce Ltd
Rover Gas Turbines Ltd
Saywell Ltd, R. F.
Scottish Aviation Ltd
Universal Flying Services Ltd
Vandyke Engineering Ltd
Villiers (Tool Developments) Ltd
Warden Aviation & Engineering Co

SERVICING, REPAIR AND OVERHAUL, INSTRUMENT
Airtech Ltd
Airwork Services Ltd
Aviation Traders (Engineering) Ltd
Brooklands Aviation Ltd
Cunard Eagle Airways Ltd
Derby Aviation Ltd
Field Aircraft Services Ltd
Flight Refuelling Ltd
M.B. Metals Ltd
McAlpine Aviation
Miles Hivolt Ltd
Reid & Sigrist Ltd
Specto Ltd
Sperry Gyroscope Co Ltd
Staravia Ltd
Vandyke Engineering Ltd
Whiteley Electrical Radio Co Ltd

SERVO MECHANISMS
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Armstrong Whitworth Equipment
Associated Electrical Industries Ltd
Boulton Paul Aircraft Ltd
Cossor Radar & Electronics Ltd
de Havilland Aircraft Co Ltd, The
Electro-Hydraulics Ltd
Fairey Engineering Ltd
Ferranti Ltd
General Precision Systems Ltd
Graseby Instruments Ltd
Hobson Ltd, H. M.
Hydraulics & Pneumatics Ltd
Ketay Ltd
Lockheed Precision Products Ltd
Miles Electronics Ltd
Miles Engineering Ltd, F. G.
Mitchell Hydraulics Ltd
Newmark Ltd, Louis
Newton Bros (Derby) Ltd
Pullin & Co Ltd, R. B.
Redwing Ltd
Short Bros & Harland Ltd
Sperry Gyroscope Co Ltd
Teddington Aircraft Controls Ltd
Ultra Electronics Ltd
Vactric Control Equipment Ltd
Western Manufacturing (Reading) Ltd
Wilmot Breeden Ltd

SHEET AND PLATE, LIGHT ALLOY
Alcan Industries Ltd
Aluminium Corporation Ltd
Birmetals Ltd
Booth Aluminium Ltd, James
British Aluminium Co Ltd, The
Henderson Safety Tank Co Ltd
High Duty Alloys Ltd
Imperial Aluminium Co Ltd
Rollet & Co Ltd, H.
Vandyke Engineering Ltd
Western Manufacturing (Reading) Ltd
Wilmot Breeden Ltd
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

SHEET METAL WORK—See Fabrications

SHIMS
Attewell & Sons Ltd, B.
Kane (Sealants) Ltd, Douglas
Macready's Metal Co Ltd

SHOCK ABSORBERS—See Mountings

SHUTTERS
Bolton Gate Co Ltd, The

SILENCERS
Baxter, Woodhouse & Taylor Ltd
Burgess Products Co Ltd
Cullum & Co Ltd, Horace
Cullum Detuners Ltd
R.F.D. Co Ltd
Rolls-Royce Ltd
Villiers (Tool Developments) Ltd
Vokes Ltd

SILICONE PRODUCTS
Amber Oils Ltd
Avica Equipment Ltd
Avon India Rubber Co Ltd, The
Bell's Asbestos & Engineering Ltd
Coin Insulation Ltd
Dowty Seals Ltd
Flexible Ducting Ltd
Hall & Hall Ltd
Imperial Chemical Industries Ltd
Kautex Ltd
Northern Rubber Co Ltd, The
Palmer Aero Products Ltd
Precision Rubbers Ltd
Valay Industries Ltd
Walker & Co Ltd, James

SIMULATORS, AIRCRAFT
Avimo Ltd
Blackburn Electronics Ltd
de Havilland Aircraft Co Ltd, The
General Precision Systems Ltd
Mastermodels Ltd
Miles Electronics Ltd
Miles Engineering Ltd, F. G.
Newmark Ltd, Louis
Redifon Ltd

SIMULATORS, RADAR
de Havilland Aircraft Co Ltd, The
Decca Radar Ltd
General Precision Systems Ltd
M.L. Aviation Co Ltd
Miles Electronics Ltd
Redifon Ltd
Solartron Electronic Group Ltd, The
Ultra Electronics Ltd

SLIDE-RULES, SPECIAL-PURPOSE
(See also Drawing Office Equipment)
Ratcliffe (Rochdale) Ltd, F. S.

SOLDERING EQUIPMENT AND SOLDER
Adcola Products Ltd
Aircraft Materials Ltd
British Insulated Callender's Cables Ltd
British Oxygen Aviation Services
Light Soldering Developments Ltd
Sheffield Smelting Co Ltd, The
Standard Telephones & Cables Ltd

SOLENOIDS
Boulton Paul Aircraft Ltd
C.W.C. Equipment Ltd
Dowty Electrics Ltd
Electro-Hydraulics Ltd
Graseby Instruments Ltd
Hendrey Relays Ltd
Partridge, Wilson & Co Ltd
Plessey Co Ltd, The
Teddington Aircraft Controls Ltd

SOUNDPROOFING MATERIALS
Baxter, Woodhouse & Taylor Ltd
Bell's Asbestos & Engineering Ltd
Burgess Products Co Ltd
Jablo Propellers Ltd
Microcell Ltd
Newalls Insulation Co Ltd
Rumbold & Co Ltd, L. A.

Dart strip/build stand—one of the range of Morfax engine stands

ANCILLARY INDUSTRY 1961...

SPRAYING EQUIPMENT (FOR PAINTS, ETC)
Atlas Copco (Great Britain) Ltd
Brent Chemical Products Ltd
Hymatic Engineering Co Ltd, The
Miles Engineering Ltd, F. G.

SPRINGS
Avon India Rubber Co Ltd, The
Cross Manufacturing Co (1938) Ltd
Fox & Co Ltd, Samuel
Hobson Ltd, H. M.
King Aircraft Corporation
Ratcliffe (Rochdale) Ltd, F. S.
Riley Ltd, Robert
Salter & Co Ltd, Geo.
Telcon Metals Ltd
Terry & Sons Ltd, Herbert
United Steel Companies Ltd, The

STABILIZERS, FLIGHT CONTROL
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Armstrong Whitworth Equipment
de Havilland Aircraft Co Ltd, The
Dowty Rotol Ltd
Hobson Ltd, H. M.
Newmark Ltd, Louis
Sperry Gyroscope Co Ltd

STAGINGS, PLATFORMS, ETC—
See Access equipment

STALL-WARNING EQUIPMENT
Aircraft Unit Engineering Co Ltd
Smiths Aviation Division
Teddington Aircraft Controls Ltd
Western Manufacturing (Reading) Ltd

STANDS, ENGINE, ETC
Aerocontacts (Ground Equipment) Ltd
Auto Diesels Ltd
Avon India Rubber Co Ltd, The
Bristol Aircraft Ltd
Brooklands Aviation Ltd
Curran Ltd, John
Edghill Equipment Ltd
Leytonstone Jig & Tool Co Ltd
Mercury Airfield Equipment Ltd
Morfax Ltd
Reynolds (Packaging) Ltd
Ross Ltd, S. Grahame
Scotney Ltd, Tom M.
Taylor (Metal Workers) Ltd, C. F
Vandyke Engineering Ltd

STARTERS
(See also Engine starters, Auxiliary power units, Ground power units)
Associated Electrical Industries Ltd (Motor & Control Gear Division)
Auto Diesels Ltd
Aviation Traders (Engineering) Ltd
Blackburn Engines Ltd
Houchin Ltd
I. V. Pressure Controllers Ltd
Partridge, Wilson & Co Ltd
Plessey Co Ltd, The
Rotax Ltd
Rover Gas Turbines Ltd
Standard Telephones & Cables Ltd
Westinghouse Brake & Signal Co Ltd
Williams & James (Engineers) Ltd

STEEL PLATE
Appleby-Frodingham Steel Co
Brown Bayley Steels Ltd
English Steel Rolling Mills Corporation Ltd
Fox & Co Ltd, Samuel
Low Moor Alloy Steelworks Ltd
Macready's Metal Co Ltd
Rapp Ltd, Leo
Telcon Metals Ltd
United Steel Companies Ltd, The
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

STEEL SHEET
Aircraft Materials
Brown Bayley Steels Ltd
Brown Bros (Metals) Ltd
English Steel Rolling Mills Corporation Ltd
Fox & Co Ltd, Samuel
Jessop-Saville Ltd
Low Moor Alloy Steelworks Ltd
Rapp Ltd, Leo
Telcon Metals Ltd
United Steel Companies Ltd, The
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

STEEL STRIP
Brown Bayley Steels Ltd
Fox & Co Ltd, Samuel
Habershon & Sons Ltd, J.J.
Jessop-Saville Ltd
Kiveton Park Steel & Wire Works Ltd
Macready's Metal Co Ltd
Rapp Ltd, Leo
Steel, Peech & Tozer
Telcon Metals Ltd
United Steel Companies Ltd, The
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

STEEL STRUCTURAL SECTIONS
Appleby-Frodingham Steel Co Ltd
Brockhouse & Co Ltd, J.
United Steel Companies Ltd, The

STEELS, AIRCRAFT
(See also Alloys, ferrous, etc)
Aircraft Materials Ltd
Brown Bayley Steels Ltd
Brown Bros (Aircraft) Ltd
Brown Bros (Metals) Ltd
Carlisle & Co Ltd, C. G.
English Steel Rolling Mills Corporation Ltd
Firth & John Brown Ltd, Thos.
Firth-Vickers Stainless Steels Ltd
Flather Ltd, W. T.
Fox & Co Ltd, Samuel
Hadfields Ltd
Jessop-Saville Ltd
Kayser, Ellison & Co Ltd
Kiveton Park Steel & Wire Works Ltd
Low Moor Alloy Steelworks Ltd
Macready's Metal Co Ltd
Park Gate Iron & Steel Co Ltd
Rapp Ltd, Leo
Telcon Metals Ltd
United Steel Companies Ltd, The
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

STEELS, CORROSION-RESISTING
(See also Alloys, ferrous, etc)
Aircraft Materials Ltd
Brown Bros (Aircraft) Ltd
Brown Bros (Metals) Ltd
Carlisle & Co Ltd, C. G.
Firth-Vickers Stainless Steels Ltd
Fox & Co Ltd, Samuel
Hadfields Ltd
Jessop-Saville Ltd
Kayser, Ellison & Co Ltd
Kiveton Park Steel & Wire Works Ltd
Low Moor Alloy Steelworks Ltd
Macready's Metal Co Ltd
Rapp Ltd, Leo
Rollet & Co Ltd, H.
Telcon Metals Ltd
United Steel Companies Ltd, The

STEELS, HEAT-RESISTING
(See also Alloys, ferrous, etc)
Brown Bayley Steels Ltd
Carlisle & Co Ltd, C. G.
Firth-Vickers Stainless Steels Ltd
Fox & Co Ltd, Samuel
Hadfields Ltd
Jessop-Saville Ltd
Kayser, Ellison & Co Ltd
Kiveton Park Steel & Wire Works Ltd
Low Moor Alloy Steelworks Ltd
Macready's Metal Co Ltd
Rapp Ltd, Leo
Telcon Metals Ltd
United Steel Companies Ltd, The

STEPS AND STAIRS, AIRCRAFT PASSENGER
Aviation Traders (Engineering) Ltd
Derby Aviation Ltd
Edghill Equipment Ltd
Lancefield Aircraft Components Ltd
Mercury Airfield Equipment Ltd
Morfax Ltd
Spurling Motor Bodies Ltd
Taylor (Metal Workers) Ltd, C. F.

ADDRESSES OF COMPANIES: pages 349-355

Boulton Paul high-precision transducer read-out equipment (five-decade null-balance system) with high-temperature displacement transducer

STORAGE EQUIPMENT
Brown Ltd, N. C.
Harvey & Co (London) Ltd, G. A.
Morfax Ltd

SWEEPERS, RUNWAY
Brockhouse & Co Ltd, J.
General Electric Co Ltd, The
Gloster Aircraft Co Ltd
Lacre Ltd
Miles Ltd, Alf'd
Zwicky Ltd

SWITCHES, AUTOMATIC AND SPECIAL-PURPOSE
Armstrong Whitworth Equipment
Associated Electrical Industries Ltd (Motor & Control Gear Division)
British Oxygen Aviation Services
Burgess Products Co Ltd
C.W.C. Equipment Ltd
Decca Radar Ltd
Dowty Electrics Ltd
Engel & Gibbs Ltd
Ericsson Telephones Ltd
Flight Refuelling Ltd
General Electric Co Ltd, The
Graseby Instruments Ltd
Irving Air Chute of Great Britain Ltd
Negretti & Zambra Ltd
Rotax Ltd
SPE Co Ltd
Standard Telephones & Cables Ltd
Stone-Chance Ltd
Teddington Aircraft Controls Ltd
Thermal Control Co Ltd
Vactric Control Equipment Ltd
Venner Ltd

SWITCHES, ELECTRICAL
Associated Electrical Industries Ltd (Motor & Control Gear Division)
Burgess Products Co Ltd
C.W.C. Equipment Ltd
Decca Radar Ltd
"Diamond H" Switches Ltd
Dowty Electrics Ltd
Dunlop Rubber Co Ltd
Engel & Gibbs Ltd
English Electric Co Ltd, The
General Electric Co Ltd, The
Graseby Instruments Ltd
Honeywell Controls Ltd
Muirhead & Co Ltd
Munro Ltd, R. W.
Negretti & Zambra Ltd
Page Engineering Co (Sunbury on Thames) Ltd
Plessey Co Ltd, The
Rotax Ltd
Teddington Aircraft Controls Ltd
Western Manufacturing (Reading) Ltd

TABLEWARE, AIRLINER
Attewell & Sons Ltd, B.
Bramah & Co Ltd, J. R.

TANKS, DROP
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Bramah & Co Ltd, J. R.
Bristol Aeroplane Plastics Ltd
Bristol Aircraft Ltd
Harvey & Co (London) Ltd, G. A.
Hickman Ltd
Lancefield Aircraft Components Ltd
Marston Excelsior Ltd
Miles Marine & Structural Plastics Ltd
Samlesbury Engineering Ltd
Short Bros & Harland Ltd
Taylor (Metal Workers) Ltd, C. F.
Taylor (Plastics) Ltd, C. F.
Vandyke Engineering Ltd

TANKS, DROP, EQUIPMENT FOR
Bristol Aeroplane Plastics Ltd
Bristol Aircraft Ltd
Edghill Equipment Ltd
Exactor Ltd
Flight Refuelling Ltd
Vandyke Engineering Ltd

TANKS, FUEL AND OIL
Aviation Traders (Engineering) Ltd
Bramah & Co Ltd, J. R.
Burnley Aircraft Products Ltd
Fireproof Tanks Ltd
Harvey & Co (London) Ltd, G. A.
Henshall & Sons (Addlestone) Ltd, W.
Hickman Ltd
I.C.I. (Hyde) Ltd
Lancefield Aircraft Components Ltd
Marston Excelsior Ltd
Middleton Sheet Metal Co Ltd
Miles Marine & Structural Plastics Ltd
Samlesbury Engineering Ltd
Taylor (Metal Workers) Ltd, C. F.
Thompson Bros (Bilston) Ltd
Vandyke Engineering Ltd
Vosper Ltd

TAPE, RECORDING
Royston Instruments Ltd

TAPES, MASKING, ETC
Aircraft Materials Ltd
Brown Bros (Aircraft) Ltd

TAPES, HEATING
French & Sons Ltd, Thomas
Telcon Metals Ltd

TAPES, IDENTIFICATION
Aircraft Materials Ltd
Miller Aviation Ltd

TAPES, INSULATING
Aircraft Materials Ltd
Associated Electrical Industries Ltd
British Insulated Callender's Cables Ltd
Fothergill & Harvey Ltd
Micanite & Insulators Co Ltd, The
Turner Bros Asbestos Co Ltd

TAPES, PROTECTIVE
AEI Radio & Electronic Components Division
British Insulated Callender's Cables Ltd

TARGETS—
See Training equipment, armament

TELEMETRY EQUIPMENT
Airtech Ltd
Beme Telecommunications Ltd
Burndept Ltd
Decca Navigator Co Ltd
EMI Electronics Ltd
Graseby Instruments Ltd
M.L. Aviation Co Ltd
McMichael Radio Ltd

[*Continued opposite*

Mullard Equipment Ltd
Plessey Co Ltd, The
Pye Telecommunications Ltd
Redifon Ltd
Rotax Ltd
Standard Telephones & Cables Ltd
Vactric Control Equipment Ltd
W. S. Electronics Ltd

TEMPERATURE-SENSITIVE EQUIPMENT

Engel & Gibbs Ltd
Hagan Controls Ltd
Negretti & Zambra Ltd
Normalair Ltd
Plessey Co Ltd, The
Sangamo Weston Ltd
Standard Telephones & Cables Ltd
Stone & Co (Deptford) Ltd, J.
Teddington Aircraft Controls Ltd

TERMINALS

AEI Radio & Electronic Components Division
Aircraft-Marine Products (G.B.) Ltd
Aircraft Materials Ltd
Belling & Lee Ltd
C. W. C. Equipment Ltd
Hellermann Ltd
Plessey Co Ltd, The
Ross, Courtney & Co Ltd
Standard Telephones & Cables Ltd
Ward, Brooke & Co Ltd

TEST EQUIPMENT, AERODYNAMIC

Bryans Aeroquipment Ltd
Graseby Instruments Ltd
Leytonstone Jig & Tool Co Ltd
T. E. M. Engineering Ltd
Test Equipment Ltd

TEST EQUIPMENT, ELECTRICAL AND ELECTRONIC

Aircraft Ground Equipment Ltd
Airmed Ltd
Andec Ltd
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Associated Electrical Industries Ltd (Motor & Control Gear Division)
B & M Electronics Ltd
Beme Telecommunications Ltd
Blackburn Electronics Ltd
Boulton Paul Aircraft Ltd
Bradley Ltd, G. & E.
British Communications Corporation Ltd
Bryans Aeroquipment Ltd
Burndept Ltd
C & N (Electrical) Ltd
Cossor Instruments Ltd
Cossor Radar & Electronics Ltd
Dawe Instruments Ltd
de Havilland Aircraft Co Ltd, The
Decca Radar Ltd
EMI Electronics Ltd
E. M. O. Instrumentation Ltd
English Electric Co Ltd, The
Ferranti Ltd
General Electric Co Ltd, The
Goodmans Industries Ltd
Graseby Instruments Ltd
Hendrey Relays Ltd
Integral Ltd
Leytonstone Jig & Tool Co Ltd
M. L. Aviation Co Ltd
McMichael Radio Ltd
Measuring Instruments (Pullin) Ltd
Miles Hivolt Ltd
Muirhead & Co Ltd
Mullard Equipment Ltd
Newmark Ltd, Louis
Page Engineering Co (Sunbury on Thames) Ltd
Plessey Co Ltd, The
Portsmouth Aviation Ltd
Racal Engineering Ltd
Robinson & Partners Ltd, F. C.
Rotax Ltd
Royston Instruments Ltd
Salford Electrical Instruments Ltd
Sanders (Electronics) Ltd, W. H.
Savage Ltd, W. Bryan
Sciaky Electric Welding Machines Ltd
Solartron Electronic Group Ltd, The
Solus-Schall Ltd
Southern Instruments Ltd
Specto Ltd
Sperry Gyroscope Co Ltd
Standard Telephones & Cables Ltd
Turner Electrical Instruments Ltd, Ernest
Ultra Electronics Ltd
Venner Electronics Ltd
Wayne Kerr Laboratories Ltd, The
Western Manufacturing (Reading) Ltd
Westland Aircraft Ltd (Saunders-Roe Division)
Whiteley Electrical Radio Co Ltd

TEST EQUIPMENT, FUEL

Exactor Ltd
Grundy & Partners Ltd
Hobson Ltd, H. M.
Leytonstone Jig & Tool Co Ltd
Mitchell Hydraulics Ltd
Morfax Ltd
SPE Co Ltd

TEST EQUIPMENT, HYDRAULIC

Aircraft Ground Equipment Ltd
Appleby & Ireland Ltd
Boulton Paul Aircraft Ltd
Electro-Hydraulics Ltd
Fairey Engineering Ltd
H. M. L. (Engineering) Ltd
High Pressure Components Ltd
Hobson Ltd, H. M.
Hydraulics & Pneumatics Ltd
Hymatic Engineering Co Ltd, The
I. V. Pressure Controllers Ltd
Integral Ltd
Langham Thompson Ltd., J.
Leytonstone Jig & Tool Co Ltd
Lockheed Precision Products Ltd
Lucas Gas Turbine Equipment Ltd
Mitchell Hydraulics Ltd
Morfax Ltd
Ross Ltd, S. Grahame
Western Manufacturing (Reading) Ltd

TEST EQUIPMENT, INSTRUMENT

B & M Electronics Ltd
Blackburn Electronics Ltd
Brown Ltd, S. G.
Bryans Aeroquipment Ltd
Cossor Instruments Ltd
Ferranti Ltd
Firth Cleveland Instruments Ltd
Graseby Instruments Ltd
Infra Red Development Co Ltd, The
Langham Thompson Ltd, J.
Leytonstone Jig & Tool Co Ltd
Newmark Ltd, Louis
Racal Engineering Ltd
Reid & Sigrist Ltd
Salford Electrical Instruments Ltd
Specto Ltd

TEST EQUIPMENT, LABORATORY

Blackburn Electronics Ltd
Bryans Aeroquipment Ltd
Cossor Instruments Ltd
Dobbie McInnes (Electronics) Ltd
Fairey Air Surveys Ltd
Graseby Instruments Ltd
H.M.L. (Engineering) Ltd
Langham Thompson Ltd, J.
Leytonstone Jig & Tool Co Ltd
Muirhead & Co Ltd
Newmark Ltd, Louis
Racal Engineering Ltd
Serck Radiators Ltd
Solus-Schall Ltd
Taylor, Taylor & Hobson
Wayne Kerr Laboratories Ltd, The
Western Manufacturing (Reading) Ltd

TEST EQUIPMENT, MECHANICAL

Aircraft Ground Equipment Ltd
Aircraft Materials Ltd
de Havilland Aircraft Co Ltd, The
E. M. O. Instrumentation Ltd
Graseby Instruments Ltd
Langham Thompson Ltd, J.
Leytonstone Jig & Tool Co Ltd
Morfax Ltd
Western Manufacturing (Reading) Ltd

TEST EQUIPMENT, METALLURGICAL

Aircraft Materials Ltd
Bristol Aerojet Ltd
Langham Thompson Ltd, J.
Leytonstone Jig & Tool Co Ltd

TEST EQUIPMENT, PNEUMATIC

AEI Instrumentation Division
Aircraft Ground Equipment Ltd
Aircraft Materials Ltd
Bryans Aeroquipment Ltd
de Havilland Aircraft Co Ltd, The
H.M.L. (Engineering) Ltd
High Pressure Components Ltd
Hymatic Engineering Co Ltd, The
I. V. Pressure Controllers Ltd
Langham Thompson Ltd, J.
Leytonstone Jig & Tool Co Ltd
Morfax Ltd
Williams & James (Engineers) Ltd

TEST EQUIPMENT, RADIO AND RADAR

Aero Electronics Ltd
B & M Electronics Ltd
Beme Telecommunications Ltd
Blackburn Electronics Ltd
Bradley Ltd, G. & E.
British Communications Corporation Ltd
C & N (Electrical) Ltd
Cossor Instruments Ltd
Cossor Radar & Electronics Ltd
de Havilland Aircraft Co Ltd, The
Decca Radar Ltd
Ekco Electronics Ltd
Ferranti Ltd
General Electric Co Ltd, The
Grundy & Partners Ltd
Langham Thompson Ltd, J.
Leytonstone Jig & Tool Co Ltd
McMichael Radio Ltd
Marconi Instruments Ltd
Mullard Equipment Ltd
Plessey Co Ltd, The
Racal Engineering Ltd
Robinson & Partners Ltd, F. C.
Sanders (Electronics) Ltd, W. H.
Solartron Electronic Group Ltd, The
Standard Telephones & Cables Ltd
W. S. Electronics Ltd
Wayne Kerr Laboratories Ltd, The
Whiteley Electrical Radio Co Ltd

TEST-BED INSTALLATIONS, COMPLETE

Curran Ltd, John
Heenan & Froude Ltd
Leytonstone Jig & Tool Co Ltd
Rover Gas Turbines Ltd

THERMOCOUPLES AND ASSOCIATED EQUIPMENT

AEI Instrumentation Division
Astralux Ltd
British Insulated Callender's Cables Ltd
Lodge Plugs Ltd
Negretti & Zambra Ltd
Rist's Wires & Cables Ltd
Sheffield Smelting Co Ltd, The
Smiths Aviation Division
Vandyke Engineering Ltd

THREAD INSERTS

Cross Manufacturing Co (1938) Ltd
Guest Keen & Nettlefolds (Midlands) Ltd
Kane (Sealants) Ltd, Douglas
Miller Aviation Ltd

THRUST-MEASURING EQUIPMENT

Curran Ltd, John
Parsons & Co Ltd, S.
Vandyke Engineering Ltd

TIMEKEEPING EQUIPMENT

Graseby Instruments Ltd

TIMING DEVICES

Associated Electrical Industries Ltd (Motor & Control Gear Division)
B & M Electronics Ltd
Carter & Co Ltd, B. & F.
G.Q. Parachute Co Ltd
Graseby Instruments Ltd
Irving Air Chute of Great Britain Ltd
Racal Engineering Ltd
Teddington Aircraft Controls Ltd
Venner Electronics Ltd
Venner Ltd

TITANIUM

Guest Keen & Nettlefolds (Midlands) Ltd
Imperial Chemical Industries Ltd
Jessop-Saville Ltd
Titanium Metal & Alloys Ltd

TOE-STRAPS, CONTROL

Palmer Aero Products Ltd

TOILET SYSTEMS AND EQUIPMENT, AIRCRAFT

Delaney Gallay Ltd
General Electric Co Ltd, The
H.M.L. (Engineering) Ltd
Henshall & Sons (Addlestone) Ltd, W.
Lancefield Aircraft Components Ltd
SPE Co Ltd
Taylor (Metal Workers) Ltd, C. F.

TOILET SERVICING EQUIPMENT, AIRCRAFT

Edghill Equipment Ltd
Lancefield Aircraft Components Ltd
Norstel & Templewood Hawksley Ltd
Teddington Aircraft Controls Ltd

TOOLS, CUTTING

Aeronautical Trades & Manufacturing Co Ltd
Brockhouse & Co Ltd, J.
English Steel Tool Corporation Ltd
Leytonstone Jig & Tool Co Ltd
Low Moor Alloy Steelworks Ltd
Macready's Metal Co Ltd
Villiers (Tool Developments) Ltd

TOOLS, ENGINEERS' HAND

Acratork Engineering Co Ltd, The
Aeronautical Trades & Manufacturing Co Ltd
Atlas Copco (Great Britain) Ltd

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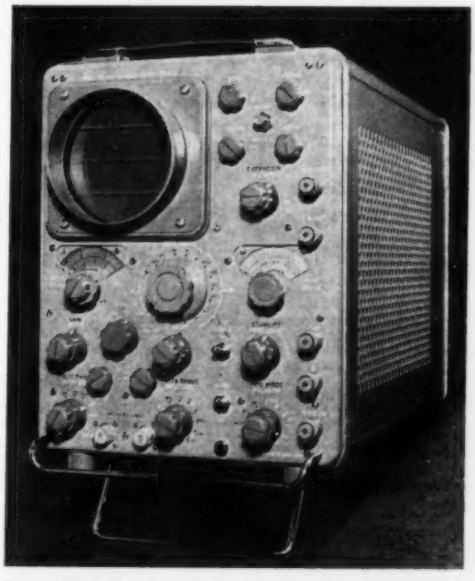


The Marconi Instruments dual-trace oscilloscope TF1331 with precision direct-reading time and voltage calibration and comprehensive trigger selection

ANCILLARY INDUSTRY 1961...

Britool Ltd
Brockhouse & Co Ltd, J.
Leytonstone Jig & Tool Co Ltd
Low Moor Alloy Steelworks Ltd
Precision Forgings Ltd
Villiers (Tool Developments) Ltd

TOOLS, FORM

Aeronautical Trades & Manufacturing Co Ltd
Bell Precision Engineering Co Ltd
Henderson Safety Tank Co Ltd
Henshall & Sons (Addlestone) Ltd, W.
Hordern Richmond Ltd
Jessop-Saville (Small Tools) Ltd
Leytonstone Jig & Tool Co Ltd
Low Moor Alloy Steelworks Ltd
Samlesbury Engineering Ltd
Thompson (Engineers) Ltd, Raymond F.
Villiers (Tool Developments) Ltd
Westway Models Ltd

TOOLS, MACHINE

Aeronautical Trades & Manufacturing Co Ltd
Armytage Bros (Knottingley) Ltd
Bell Precision Engineering Co Ltd
Elgar Machine Tool Co Ltd
Gear Grinding Co Ltd, The
Leytonstone Jig & Tool Co Ltd
Low Moor Alloy Steelworks Ltd
Villiers (Tool Developments) Ltd

TOOLS, PORTABLE POWER

Aeronautical Trades & Manufacturing Co Ltd
Aircraft-Marine Products (G.B.) Ltd
Aircraft Materials Ltd
Armstrong Whitworth Aircraft Ltd, Sir W. G.
Atlas Copco (Great Britain) Ltd
Bosch Ltd
Desoutter Bros Ltd
Hymatic Engineering Co Ltd, The
Leytonstone Jig & Tool Co Ltd
Rawlplug Co Ltd, The
Villiers (Tool Developments) Ltd

TOOLS, PRESS

Amar Tool & Gauge Co Ltd
Attewell & Sons Ltd, B.
Bell Precision Engineering Co Ltd
Cornercroft Ltd
Gloster Engineering (Cheltenham) Ltd
Henderson Safety Tank Co Ltd
Henshall & Sons (Addlestone) Ltd, W.
Hordern Richmond Ltd
Leytonstone Jig & Tool Co Ltd
Miles Marine & Structural Plastics Ltd
Samlesbury Engineering Ltd
Taylor (Metal Workers) Ltd, C. F.
Thompson (Engineers) Ltd, Raymond F.
Villiers (Tool Developments) Ltd
Westway Models Ltd

TOOLS, RIVETING

Aeronautical Trades & Manufacturing Co Ltd
Aircraft Materials Ltd
Avdel Ltd
Bardolph & Partners Ltd, J. F.
Leytonstone Jig & Tool Co Ltd
Tucker Eyelet Co Ltd, Geo
Villiers (Tool Developments) Ltd

TOOLS, SPECIAL-PURPOSE

Aircraft-Marine Products (G.B.) Ltd
Aircraft Materials Ltd
Bell Precision Engineering Co Ltd
Bristol Aircraft Ltd
Cornercroft Ltd
Cramic Aircraft Components Ltd
Didsbury Engineering Co Ltd
Henshall & Sons (Addlestone) Ltd, W.
Kane (Sealants) Ltd, Douglas
Leytonstone Jig & Tool Co Ltd
Low Moor Alloy Steelworks Ltd
Miles Engineering Ltd, F. G.
Miles Marine & Structural Plastics Ltd
Miller Aviation Ltd
Morfax Ltd
Rotax Ltd
Taylor (Metal Workers) Ltd, C. F.
Telcon Metals Ltd
Thompson (Engineers) Ltd, Raymond F.
Vactric Precision Tools Ltd
Villiers (Tool Developments) Ltd

TRACTORS, AIRCRAFT
(See also Handling equipment)

Brown Tractors (Sales) Ltd, David
Douglas (Equipment) Ltd, F. L.
Mercury Truck & Tractor Co Ltd, The
Searle Ltd, R. J.

TRAINING, AIRCREW

Airwork Services Ltd
Bristol Aircraft Ltd
Derby Aviation Ltd
Universal Flying Services Ltd

TRAINING, TECHNICAL

Airwork Services Ltd
Bristol Aircraft Ltd
de Havilland Aircraft Co Ltd, The
Decca Radar Ltd
Derby Aviation Ltd
Gloster Aircraft Co Ltd
International Aeradio Ltd
M. L. Aviation Co Ltd
Universal Flying Services Ltd

TRAINING EQUIPMENT, AIRCREW

Airtech Ltd
Bristol Aircraft Ltd
Brooklands Aviation Ltd
General Precision Systems Ltd
M. L. Aviation Co Ltd
McMichael Radio Ltd
Miles Electronics Ltd
Rover Gas Turbines Ltd

TRAINING EQUIPMENT, ARMAMENT

Flight Refuelling Ltd
General Precision Systems Ltd
Jablo Propellers Ltd
Lea Bridge Industries Ltd
M. L. Aviation Co Ltd
Mayday Equipment Ltd
Miles Electronics Ltd
R.F.D. Co Ltd

TRANSFERS, LETTERING, ETC

Kaylee Transfers Ltd
Renamel (A.I.D.) Ltd

TRANSFORMERS

Airtech Ltd
Andec Ltd
Astralux Ltd
Blackburn Electronics Ltd
Cossor Radar & Electronics Ltd
English Electric Co Ltd, The
Ferranti Ltd
General Electric Co Ltd, The
Marconi's Wireless Telegraph Co Ltd
Miles Hivolt Ltd
Partridge, Wilson & Co Ltd
Plessey Co Ltd, The
Rotax Ltd
Standard Telephones & Cables Ltd
Whiteley Electrical Radio Co Ltd

TRANSISTORS—See Semiconductors

TROLLEYS

Autoset (Production) Ltd
Aviation Traders (Engineering) Ltd
Edghill Equipment Ltd
Henderson Safety Tank Co Ltd
Lancefield Aircraft Components Ltd
Leytonstone Jig & Tool Co Ltd
M.L. Aviation Co Ltd
Mercury Truck & Tractor Co Ltd, The
Portsmouth Aviation Ltd
Siebe, Gorman & Co Ltd

TRUCKS (FORK-LIFT, ETC)

Didsbury Engineering Co Ltd
Electro-Hydraulics Ltd
Heston Aircraft & Associated Engineers Ltd
Mercury Truck & Tractor Co Ltd, The

TUBING, AIRCRAFT STAINLESS

Accles & Pollock Ltd
Bristol Aerojet Ltd
Chesterfield Tube Co Ltd, The
Low Moor Fine Steels Ltd
Palmer Aero Products Ltd
Rapp Ltd, Leo
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

TUBING, AIRCRAFT STEEL

Accles & Pollock Ltd
Aircraft Materials Ltd
Chesterfield Tube Co Ltd, The
Low Moor Fine Steels Ltd
Palmer Aero Products Ltd
Rapp Ltd, Leo
Reynolds Tube Co Ltd
Tubes Ltd
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

TUBING, FLEXIBLE—See Hose, flexible

TUBING, SEAMLESS

Accles & Pollock Ltd
Alcan Industries Ltd
Avon India Rubber Co Ltd, The
Booth Aluminium Ltd, James
Brown Bros (Metals) Ltd
Chesterfield Tube Co Ltd, The
Reynolds Tube Co Ltd
Rollet & Co Ltd, H.
Tubes Ltd
Tungum Co Ltd, The
Wiggin & Co Ltd, Henry
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

TUBING, OTHER THAN ABOVE

AEI Radio & Electronic Components Division
Accles & Pollock Ltd
Aircraft Materials Ltd
Birmetals Ltd
Bristol Aeroplane Plastics Ltd
British Aluminium Co Ltd, The
British Insulated Callender's Cables Ltd
Coin Insulation Ltd
Flexible Ducting Ltd
Hickman Ltd
Imperial Aluminium Co Ltd
Imperial Chemical Industries Ltd
King Aircraft Corporation
Low Moor Fine Steels Ltd
Miles Marine & Structural Plastics Ltd
Morfax Ltd
Power Flexible Tubing Co Ltd
Rollet & Co Ltd, H.
Southern Forge Ltd
Suntex Safety Glass Industries Ltd
Taylor (Plastics) Ltd, C. F.
Thermo-Plastics Ltd
Tubes Ltd
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

TUBULAR COMPONENTS

Accles & Pollock Ltd
Aviation Traders (Engineering) Ltd
Heston Aircraft & Associated Engineers Ltd
High Pressure Components Ltd
Lancefield Aircraft Components Ltd
Middleton Sheet Metal Co Ltd
R.M.R. Engineering
Redwing Ltd
Reynolds Tube Co Ltd
Taylor (Metal Workers) Ltd, C. F.
Tubes Ltd.

TUNGUM ALLOYS

Tungum Co Ltd, The
Wilson & Sons (London) Ltd, W.
Wilson Alloys Ltd

TYRES AND WHEELS, AIRCRAFT
(See also Brakes)

Aerocontacts (Aircraft Distributors) Ltd
Dunlop Rubber Co Ltd
Firestone Tyre & Rubber Co Ltd
Goodyear Tyre & Rubber Co (Great Britain) Ltd

ULTRASONIC EQUIPMENT, TEST

Dawe Instruments Ltd
Savage Ltd, W. Bryan
Solus-Schall Ltd

ULTRASONIC EQUIPMENT, CLEANING

Burndept Ltd
Dawe Instruments Ltd
Imperial Chemical Industries Ltd
Mullard Equipment Ltd
Savage Ltd, W. Bryan

UNDERCARRIAGES—See Landing gear

UNIFORM—See Clothing

UPHOLSTERY MATERIALS

British Replin Ltd
Cox & Son Ltd, John
Firth & Sons Ltd, T. F.
Hairlok Co Ltd, The
I.C.I. (Hyde) Ltd
Jablo Propellers Ltd
Lancefield Aircraft Components Ltd
Latex Upholstery Ltd
Williamson & Son Ltd, Jas

VALVES, ELECTRONIC

AEI Radio & Electronic Components Division
Aero Electronics Ltd
Associated Electrical Industries Ltd
EMI Electronics Ltd
English Electric Valve Co Ltd
Ericsson Telephones Ltd
Ferranti Ltd
General Electric Co Ltd, The
Mullard Ltd
Normalair Ltd
Standard Telephones & Cables Ltd
Z & I Aero Services Ltd

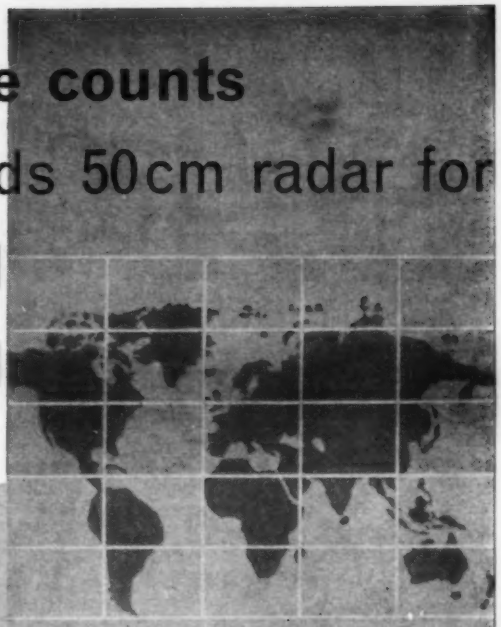
VALVES FOR AIR AND GASES

British Ermeto Corporation Ltd
British Oxygen Aviation Services
Bryans Aeroquipment Ltd
Dunlop Rubber Co Ltd
Electro-Hydraulics Ltd
Flight Refuelling Ltd
Godfrey & Partners Ltd, Sir George
Graseby Instruments Ltd
High Pressure Components Ltd
Hydraulics & Pneumatics Ltd
Hymatic Engineering Co Ltd, The
I.V. Pressure Controllers Ltd
Kidde Co Ltd, The Walter
Normalair Ltd
Palmer Aero Products Ltd
Rollason Aerocessories Ltd
Rotax Ltd
Saunders Valve Co Ltd
Siebe, Gorman & Co Ltd
Stone & Co (Deptford) Ltd, J.
Teddington Aircraft Controls Ltd
Williams & James (Engineers) Ltd
Wilmot Breeden Ltd

David Brown 950 Turbo Taskmaster aircraft tractor with 1961 redesigned superstructure

Wherever performance counts

the trend is towards 50cm radar for airways surveillance and terminal area control



50 CM

Ensures longer range for given transmitter power.

Penetrates thick weather without loss of efficiency.

Crystal controlled MTI for elimination of permanent clutter.

Provides instant readiness after prolonged shut down.

GIVES THE LONG, CLEAR VIEW

MARCONI

Complete Civil, Military and Naval Radar Systems
Surveyed, Planned, Installed, Maintained

RADAR DIVISION, MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED
CHELMSFORD, ESSEX, ENGLAND

MARCONI 50cm RADAR

has been chosen for

London Airport
Johannesburg
Gatwick
Dunedin (N.Z.)
Geneva
Oberpfaffenhofen
Boscombe Down
Bitteswell
Hong Kong
Manchester
Brussels
Warton
Calcutta
Hatfield
Istres
St. Annes
Birmingham
Rome
Jersey
Bretigny
Wellington (N.Z.)
Ostend
Copenhagen
Ohakea (N.Z.)
and the Royal research establishments at:—
Farnborough
Bedford and
Pershore

The Folland Lightweight fully-automatic Ejection Seat, Mark 4, is standard equipment for the Gnat Trainer which is now in quantity production for the Royal Air Force. The parachute equipment is manufactured and has been developed by the G. Q. Parachute Company in conjunction with and to the specification of Folland Aircraft Limited.

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G. Q. PARACHUTE CO. LTD., Stadium Works, Portugal Road, Woking, Surrey, England

VALVES FOR FLUIDS
British Ermeto Corporation Ltd
British Oxygen Aviation Services
Dowty Rotol Ltd
Dunlop Rubber Co Ltd
Electro-Hydraulics Ltd
Exactor Ltd
Fairey Engineering Ltd
Flight Refuelling Ltd
H.M.L. (Engineering) Ltd
High Pressure Components Ltd
Hydraulics & Pneumatics Ltd
I.V. Pressure Controllers Ltd
Integral Ltd
Lockheed Precision Products Ltd
Lucas Gas Turbine Equipment Ltd
Mitchell Hydraulics Ltd
Palmer Aero Products Ltd
Plessey Co Ltd, The
Rollason Aerocessories Ltd
SPE Co Ltd
Saunders Valve Co Ltd
Simmonds Aerocessories Ltd
Teddington Aircraft Controls Ltd
Wilmot Breeden Ltd
Zwicky Ltd

VALVES, PISTON-ENGINE
Villiers (Tool Developments) Ltd

VEHICLES (OTHER THAN CATEGORIES SPECIFICALLY NAMED)
Douglas (Equipment) Ltd, F. L.
Miles Ltd, Alf'd
Samlesbury Engineering Ltd
Searle Ltd, R. J.
Spurling Motor Bodies Ltd
Thompson Bros (Bilston) Ltd

VIBRATION GENERATORS
Dawe Instruments Ltd
Fairey Air Surveys Ltd
Goodmans Industries Ltd
Hendrey Relays Ltd
Savage Ltd, W. Bryan

VOLTAGE REGULATORS
AEI Instrumentation Division
Associated Electrical Industries Ltd
Associated Electrical Industries Ltd (Motor & Control Gear Division)
Astralux Ltd
Avimo Ltd
English Electric Co Ltd, The
Ferranti Ltd
General Electric Co Ltd, The
Miles Hivolt Ltd
Mullard Equipment Ltd
Newton Bros (Derby) Ltd
Petbow Ltd (Liverpool Works)
Plessey Co Ltd, The
Rotax Ltd
Sanders (Electronics) Ltd, W. H.
Stone & Co (Deptford) Ltd, J.
Texas Instruments Ltd

WASHERS—See A.G.S. parts

WATCHES
Hatton Jewellery & Watch Co Ltd
Newmark Ltd, Louis

WAVEGUIDES
Amphenol-Borg Ltd
Associated Electrical Industries Ltd
Astralux Ltd
British Insulated Callender's Cables Ltd
British Oxygen Co Ltd
Chinn & Co Ltd, J. S.
Decca Radar Ltd
Delaney Gallay Ltd
EMI Electronics Ltd
Ferranti Ltd
General Electric Co Ltd, The
Lancefield Aircraft Components Ltd
Marconi's Wireless Telegraph Co Ltd
Marston Excelsior Ltd
Microcell Ltd
Miles Engineering Ltd, F. G.
Rollet & Co Ltd, H.
Sanders (Electronics) Ltd, W. H.
Standard Telephones & Cables Ltd
Tecalemit Ltd
Telcon Metals Ltd
Vandyke Engineering Ltd

WEIGHING EQUIPMENT, WORKSHOP
EMI Electronics Ltd
Parsons & Co Ltd, S.

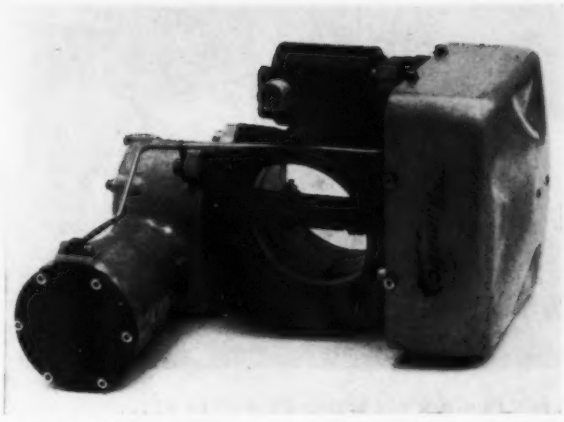
WEIGHING EQUIPMENT AIRCRAFT
Parsons & Co Ltd, S.

WEIGHING EQUIPMENT, PASSENGER, BAGGAGE, ETC
Parsons & Co Ltd, S.
Salter & Co Ltd, Geo

WELDING EQUIPMENT, ELECTRICAL
British Manufacture & Research Co Ltd
Burnley Aircraft Products Ltd
Delaney Gallay Ltd
English Electric Co Ltd, The
Hendrey Relays Ltd
Murex Welding Processes Ltd
Palmer Aero Products Ltd
Petbow Ltd
Sanders (Electronics) Ltd, W. H.
Sciaky Electric Welding Machines Ltd
Standard Telephones & Cables Ltd

WELDING EQUIPMENT, OTHER THAN ELECTRICAL
C & N (Electrical) Ltd
Palmer Aero Products Ltd
Redifon Ltd
Standard Telephones & Cables Ltd

WHEELS, CASTORS, ETC, INDUSTRIAL
(See also specific items)
Autoset (Production) Ltd
Flexello Castors & Wheels Ltd



Hymatic PAS217 butterfly pressure control valve, as used for boundary-layer and pressure control for de-icing

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Dunlop Rubber Co Ltd
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Burgess Products Co Ltd
General Electric Co Ltd, The
Graseby Instruments Ltd
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Harvey & Co (London) Ltd, G. A.
Morfax Ltd
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(See also Cables, control)
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British Ropes Ltd
Fox & Co Ltd, Samuel
Kiveton Park Steel & Wire Works Ltd
Rollet & Co Ltd, H.
Telcon Metals Ltd
United Steel Companies Ltd, The

WIRE BRAIDING
King Aircraft Corporation
Sparklets Products (British Oxygen Co Ltd)

WIRE ROPES, BRAIDING, ETC, MACHINERY FOR MANUFACTURE OF
Carter & Co Ltd, B. & F.

WIRE, ELECTRO-THERMAL
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WIRING AND WIRING ACCESSORIES, AIRCRAFT AND ENGINE
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C.W.C. Equipment Ltd
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M.B. Metals Ltd
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AEI Instrumentation Division, Trafford Park, Manchester 17. T: Trafford Park 2431.
AEI Lamp & Lighting Co Ltd, 44 Fitzroy Road, London NW1. T: Primrose 7750.
AEI Plastics (Aldridge) Ltd, Redhouse Industrial Estate, Aldridge, Staffs. T: Aldridge 52031.
AEI Radio & Electronic Components Division, 155 Charing Cross Road, London WC2. T: Gerrard 9797.
AEI Telecommunications Division, Woolwich, London SE18. T: Woolwich 2020.
A.K. Fans Ltd, 20 Upper Park Road, London NW3. T: Primrose 5969.
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Accles & Pollock Ltd, Oldbury, Birmingham. T: Broadwell 1500.
Acratork Engineering Co Ltd, The, Cory's Buildings, Cardiff. T: Cardiff 31141.
Acton Bolt Ltd, 26 Chase Road, London NW10. T: Elgar 5775.
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Aero Controls Ltd, Weedon Road Industrial Estate, Northampton. T: Northampton 33131.
Aero Electronics Ltd, Gatwick House, Horley, Surrey. T: Horley 4455.
Aero-Enterprises (Boreham Wood) Ltd, 17 Drayton Road, Boreham Wood, Herts. T: Elstree 2688.
Aerocontacts (Aircraft Distributors) Ltd, Gatwick House, Horley, Surrey. T: Horley 4455.
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Aerocontacts (Sales) Ltd, Gatwick House, Horley, Surrey. T: Horley 4455.
Aerogalley Ltd, Gatwick House, Horley, Surrey. T: Horley 4455.
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Aeronautical Trades & Manufacturing Co Ltd, 142 Camberwell Road, London SE5. T: Rodney 7209.
Air Engine Parts Ltd, Blindley Heath, Lingfield, Surrey. T: Lingfield 2646.
Air Engine Services (U.S.-U.K.) Ltd, Blindley Heath, Lingfield, Surrey. T: Lingfield 2646.
Aircraft & General Finance Corporation Ltd, Piccadilly House, Piccadilly Circus, London SW1. T: Regent 7685.
Aircraft Furnishing Ltd, 41 Lonsdale Road, London W11. T: Bayswater 6262.
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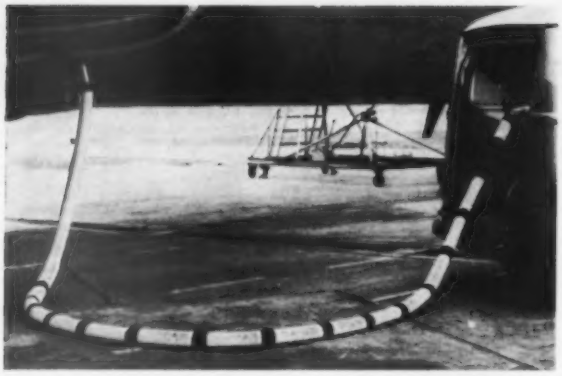
Andec Ltd, Bennet Road, Reading, Berks. T: Reading 82401.
Anticoustic Co, The, 7 Millmead, Guildford, Surrey. T: Guildford 66488.



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Armstrong Whitworth Equipment, Hucclecote, Gloucester. T: Gloucester 66781.
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Associated Electrical Industries Ltd, Motor & Control Gear Division, Aircraft Equipment Sales, Coventry, Warwicks. T: Coventry 24181.
Associated Iliffe Press Ltd, Dorset House, Stamford Street, London SE1. T: Waterloo 3333.
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Atlas Plating Works Ltd, 79 Avenue Road, Acton, London W3. T: Acton 1102.
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Avica Equipment Ltd, Mark Road, Hemel Hempstead, Herts. T: Boxmoor 4711.
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B.B. Chemical Co Ltd, Ulverscroft Road, Leicester. T: Leicester 50015.
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Blackburn Electronics Ltd, Brough, Yorks. T: Brough 121.
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Booth Aluminium Ltd, James, Kitts Green, Birmingham 33. T: Stechford 4020.
Bosch Ltd, 20 Carlisle Road, The Hyde, Hendon, London NW9. T: Colindale 0161.
Boulton Paul Aircraft Ltd, Wolverhampton, Staffs. T: Fordhouses 3191.
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Bramah & Co Ltd, J. R., Devonshire Street, Sheffield 3, Yorks. T: Sheffield 24228.
Brand & Co Ltd, R. A., Works Road, Letchworth, Herts. T: Letchworth 1990.
Brent Chemical Products Ltd, Commerce Road, Brentford, Middx. T: Isleworth 5444.
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Bristol Aeroplane Plastics Ltd, Filton House, Filton, Bristol. T: Bristol 693831.
Bristol Aircraft Ltd, Filton House, Filton, Bristol. T: Bristol 693831.
British Aluminium Co Ltd, The, Norfolk House, St James's Square, London SW1. T: Trafalgar 8888.
British Aviation Insurance Co Ltd, The, 3-4 Lime Street, London EC3. T: Mansion House 0444.
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British Insulated Callender's Cables Ltd, 21 Bloomsbury Street, London WC1. T: Museum 1600.
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British MonoRail Ltd, Wakefield Road, Brighouse, Yorks. T: Brighouse 2244.
British Oxygen Aviation Services, Pinnacles Works, Elizabeth Way, Harlow, Essex. T: Harlow 26891.
British Oxygen Co Ltd, The, Woodside Works, Newlay, Leeds 13. T: Horsforth 4251.
British Paints Ltd, Northumberland House, 303-306 High Holborn, London WC1. T: Holborn 9581.
British Replin Ltd, 2 South Audley Street, London W1. T: Grosvenor 6692.
British Ropes Ltd, Carr Hill, Balby, Doncaster, Yorks. T: Doncaster 4010.
British Timken Division of The Timken Roller Bearing Co, Duston, Northampton. T: Northampton 4921.
Britool Ltd, Britool Works, Fourth Avenue, Bushbury, Wolverhampton. T: Wolverhampton 31281.
Britten-Norman Ltd, Bembridge Airport, Isle of Wight. T: Bembridge 126.
Brockhouse & Co Ltd, J., Victoria Works, West Bromwich, Staffs. T: Wednesbury 0243.
Brooklands Aviation Ltd, Beech Hollow, Vale Road, Oatlands Park, Weybridge, Surrey. T: Weybridge 3821.
Brown Bayley Steels Ltd, "Riverdale," Riverdale Road, Sheffield 10. T: Sheffield 33931.
Brown Bros (Aircraft) Ltd, Bedford Road, Northampton. T: Northampton 4940.
Brown Bros (Metals) Ltd, Downs Road, London E5. T: Clissold 2561.
Brown Ltd, N. C., Eagle Steelworks, Rochdale Road East, Heywood, Lancs. T: Heywood 69018.
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Brush Crystal Co Ltd, Hythe, Southampton. T: Hythe 3031.
Bryans Aeroquipment Ltd, 1 and 15 Willow Lane, Mitcham, Surrey. T: Mitcham 5134.
Burgess & Co Ltd, G. N., Hanworth Trading Estate, Hampton Road, Feltham, Middx. T: Feltham 4871.
Burgess Products Co Ltd, Brookfield Road, Hinckley, Leics. T: Hinckley 3701.
Burndept Ltd, West Street, Erith, Kent. T: Erith 33080.
Burnley Aircraft Products Ltd, Fulledge Works, Holmes Street, Burnley, Lancs. T: Burnley 7681.

C & N (Electrical) Ltd, The Green, Gosport, Hants. T: Gosport 80221.
CIBA (A.R.L.) Ltd, Duxford, Cambridge. T: Sawston 2121.
CJC Developments (Portsmouth) Ltd, Fitzherbert Road, Farlington, Portsmouth, Hants. T: Cosham 76437.
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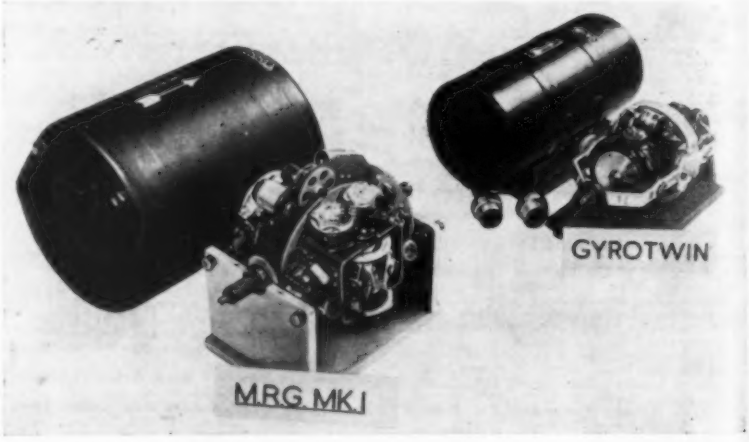
Gyros by S. G. Brown Ltd. The Gyrotwin, referred to on page 321, is the latest version of their Master Dynamic Reference System



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Left: Capt. J. A. Cameron, Manager BEA Helicopter Unit. Right: Mr. J. S. King Asst. Manager, Aero Sales, Sperry.

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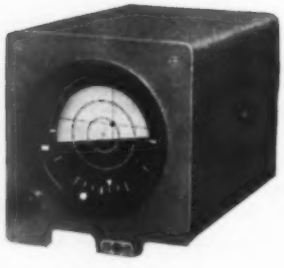

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Coopers Mechanical Joints Ltd, 14 Liverpool Road, Slough, Bucks. T: Slough 24511.
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Cory Bros & Co Ltd (Survival Equipment Division), 8 Great Tower Street, London EC3. T: Mansion House 3477.
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Cossor Instruments Ltd, Cossor House, Highbury Grove, London N5. T: Canonbury 1234.
Cossor Radar & Electronics Ltd, The Pinnacles, Elizabeth Way, Harlow, Essex. T: Harlow 26862.
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Coventry Climax Engines Ltd, Widdrington Road, Coventry. T: Coventry 28481.
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de Havilland Engine Co Ltd, The, Leavesden, nr Watford, Herts. T: Garston 4000.
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Decca Radar Ltd, 9 Albert Embankment, London SE1. T: Reliance 8111.
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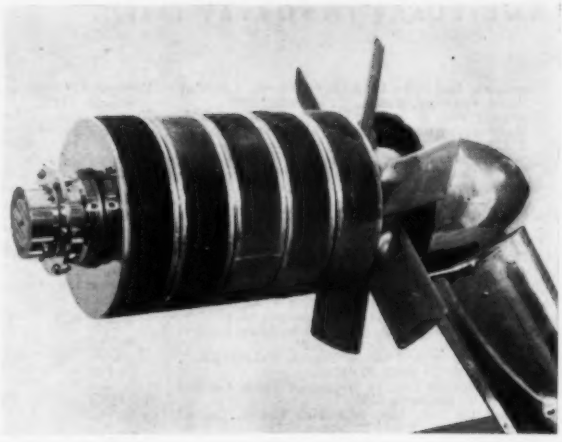

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Dowty Fuel Systems Ltd, Arle Court, Cheltenham, Glos. T: Cheltenham 53471.
Dowty Rotol Ltd, Cheltenham Road East, Gloucester, and Arle Court, Cheltenham. T: Gloucester 24431 and Cheltenham 53471.
Dowty Seals Ltd, Ashchurch, Tewkesbury, Glos. T: Tewkesbury 2271.
Dragonair Ltd, Fitzherbert Road, Farlington, Portsmouth, Hants. T: Cosham 76451.
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Durion Ltd, Old Bracknell Lane, Downshire Way, Bracknell, Berks. T: Bracknell 1901.
Dzus Fastener Europe Ltd, Farnham Factory Estate, Farnham, Surrey. T: Farnham 4422.

EMI Electronics Ltd, Hayes, Middx. T: Hayes 3888.
E.M.O. Instrumentation Ltd, Western Road, Bracknell, Berks. T: Bracknell 2626.
E.N.V. Engineering Co Ltd, Hythe Road, Willesden, London NW10. T: Ladbroke 3622.
E.P.S. (Research & Development) Ltd, Staplehurst Road, Sittingbourne, Kent. T: Sittingbourne 2313.
Eastern Aero Electrical Services Ltd, Priory Street, Colchester, Essex. T: Colchester 6173.
Edghill Equipment Ltd, Odiham Road, Hook, nr Basingstoke, Hants. T: Hook 309.
Ekco Electronics Ltd, Ekco Works, Southend-on-Sea, Essex. T: Southend-on-Sea 49491.
Electro-Hydraulics Ltd, Liverpool Road, Warrington, Lancs. T: Warrington 35241.
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Elliot Equipment Ltd—*see* Cory Bros & Co Ltd.
Elliott Bros (London) Ltd, Century Works, Lewisham, London SE13. T: Tideway 1271.
Engel & Gibbs Ltd, Elstree Way, Boreham Wood, Herts. T: Elstree 2291.
English Electric Aviation Ltd (Aircraft Division), 100 Pall Mall, London SW1. T: Whitehall 1020.
English Electric Aviation Ltd (Guided Weapons Division), Six Hills Way, Stevenage, Herts. T: Stevenage 940.
English Electric Co Ltd, The, English Electric House, Strand, London WC2. T: Covent Garden 1234.
English Electric Valve Co Ltd, Waterhouse Lane, Chelmsford, Essex. T: Chelmsford 3491.
English Steel Castings Corporation Ltd, River Don Works, Sheffield. T: Sheffield 49071.
English Steel Forge & Engineering Corporation Ltd, River Don Works, Sheffield. T: Sheffield 49071.
English Steel Rolling Mills Corporation Ltd, River Don Works, Sheffield. T: Sheffield 49071.
English Steel Tool Corporation Ltd, North Street Works, Openshaw, Manchester. T: Manchester East 1371.
Equator Wheels & Sections Ltd, Raglan Street, Wolverhampton. T: Wolverhampton 21605.
Ericsson Telephones Ltd, Beeston, Nottingham. T: Nottingham 25-4831.
Esavian Ltd, Esavian Works, Stevenage, Herts. T: Stevenage 500.
Esso Petroleum Co Ltd, Aviation Department, 50 Stratton Street, London W1. T: Hyde Park 7030.
Exactor Ltd, Sterling Works, Blacknell Lane, Crewkerne, Somerset. T: Crewkerne 795.
Export Packing Service Ltd, Imperial Buildings, 56 Kingsway, London WC2. T: Chancery 5121.

Fafnir Bearing Co Ltd, Upper Villiers Street, Wolverhampton. T: Wolverhampton 26101.
Fairey Air Surveys Ltd, White Waltham Aerodrome, nr Maidenhead, Berks. T: Maidenhead 161.
Fairey Engineering Ltd, Heston, Middx. T: Hayes 2821.
Fairey Marine Ltd, Hamble, Hants. T: Hamble 2135.
Feltham & Son Ltd, Walter H, Imperial Works, Tower Bridge Road, London SE1. T: Hop 1784.
Ferranti Ltd, Hollinwood, Lancs. T: Failsworth 2000.
Fibreglass Ltd, St Helens, Lancs. T: St Helens 4022.
Field Aircraft Services Ltd, 72 Wigmore Street, London W1. T: Welbeck 7799.
Fireproof Tanks Ltd, The Airport, Portsmouth, Hants. T: Portsmouth 62391.
Firestone Tyre & Rubber Co Ltd, Great West Road, Brentford, Middx. T: Isleworth 4141.
Firth & John Brown Ltd, Thos., PO Box 114, Atlas Works, Sheffield 4. T: Sheffield 20081.
Firth & Sons Ltd, T. F., Clifton Mills, Brighouse, Yorks. T: Brighouse 374.
Firth Cleveland Instruments Ltd, 7 Cleveland Row, St James's, London SW1. T: Whitehall 3100.
Firth-Derihon Stampings Ltd, The, PO Box 8, Sheffield Road, Tinsley, Sheffield 9. T: Sheffield 42051.
Firth-Vickers Stainless Steels Ltd, Staybrite Works, Weedon Street, Sheffield 9. T: Sheffield 42051.
Fishers, 86-88 Wellington Street, Woolwich, London SE18. T: Woolwich 1055.
Flair Aviation Sales Co Ltd, Tower House, College Road, Bromley, Kent. T: Ravenswood 6414.
Flather Ltd, W. T., Standard Steel Works, Tinsley, Sheffield. T: Sheffield 41152.
Flexello Castors & Wheels Ltd, Slough, Bucks. T: Slough 24121.
Flexible Ducting Ltd, Maryhill, Glasgow NW. T: Maryhill 3359.
Flexibox Ltd, Nash Road, Trafford Park, Manchester 17. T: Trafford Park 1477.
Flight Equipment & Engineering Ltd, 142 Cromwell Road, London SW7. T: Fremantle 3011.
Flight Refuelling Ltd, Tarrant Rushton Airfield, nr Blandford, Dorset. T: Blandford 501.
Flying Service Engineering & Equipment Ltd, 134 High Street, Chesham, Bucks. T: Chesham 81025.
Foldex Ltd, 45 Mitchell Street, London EC1. T: Clerkenwell 0711.
Folland Aircraft Ltd, Hamble, Southampton, Hants. T: Hamble 3371.
Formica Ltd, 84 Regent Street, London W1. T: Regent 8020.
Fothergill & Harvey Ltd, Summit, Littleborough, Lancs. T: Littleborough 88831.
Fox & Co Ltd, Samuel, Stocksbridge Works, Sheffield. T: Sheffield 345281.
Fox & Sons (Aviation) Ltd, C. J., 117 Victoria Street, London SW1. T: Victoria 0204.
Frankenstein & Sons (Manchester) Ltd, Victoria Rubber Works, Newton Heath, Manchester 10. T: Failsworth 1166.
French & Sons Ltd, Thomas, Chester Road, Manchester 15. T: Blackfriars 1887.

G & M Air Interests Ltd, 160 Piccadilly, London W1. T: Hyde Park 1062.
G.Q. Parachute Co Ltd, Stadium Works, Portugal Road, Woking, Surrey. T: Woking 2277.
Garringtons Ltd—*see* Precision Forgings Ltd
Gear Grinding Co Ltd, The, Cranmore Boulevard, Shirley, Solihull, Warwicks. T: Shirley 2231.
General Electric Co Ltd, The, Magnet House, Kingsway, London WC2. T: Temple Bar 8000.
General Fire Appliance Co Ltd, St Florian House, 3 George Street, Croydon, Surrey. T: Croydon 2273.
General Precision Systems Ltd, Bicester Road, Aylesbury, Bucks. T: Aylesbury 4611.
General Radiological Ltd, County Building, Honeypot Lane, Stanmore, Middx. T: Wordsworth 4300.
Girdlestone Pumps Ltd, 23 Davies Street, London W1. T: Mayfair 1354.
Girling Ltd, Kings Road, Tyseley, Birmingham 11. T: Acocks Green 3371.
Gloster Aircraft Co Ltd, Gloucester. T: Gloucester 67011.
Gloster Engineering (Cheltenham) Ltd, 30-31 St Paul's Street North, Cheltenham, Glos. T: Cheltenham 54779.
Godfrey & Partners Ltd, Sir George, Hampton Road West, Hanworth, Middx. T: Feltham 3291.

ANCILLARY INDUSTRY 1961...

Goodmans Industries Ltd, Axiom Works, Lancelot Road, Wembley, Middx. T: Wembley 1200.
Goodyear Tyre & Rubber Co (Great Britain) Ltd, Bushbury, Wolverhampton. T: Wolverhampton 22321.
Graseby Instruments Ltd, Kingston By-Pass Road, Tolworth, Surrey. T: Elmbridge 5742.
Graviner Manufacturing Co Ltd, Poyle Mill, Slough, Bucks. T: Colnbrook 2345.
Grundy & Partners Ltd, 3 The Causeway, Teddington, Middx. T: Teddington Lock 3402.
Guest Keen & Nettlefolds (Midlands) Ltd, Screw Division, PO Box 24, Heath Street, Birmingham 18. T: Smethwick 1441.

H.M.L. (Engineering) Ltd, Harpers Yard, St Johns Road, Isleworth, Middx. T: Isleworth 3011.
Habershon & Sons Ltd, J. J., Holmes Mills, Rotherham, Yorks. T: Rotherham 2081.
Hadfields Ltd, East Hecla Works, Vulcan Road, Sheffield 9. T: Sheffield 41001.
Hagan Controls Ltd, 14 Grosvenor Place, London SW1. T: Belgravia 6382.
Hairlok Co Ltd, The, Iddesleigh House, Caxton Street, London SW1. T: Abbey 6722.
Hall & Hall Ltd, Oldfield Works, Hampton, Middx. T: Molesey 2180.
Hall & Sons (Bristol & London) Ltd, John, "Romilly House," Petherton Road, Hengrove, Knowle, Bristol 4. T: Whitchurch 2162.
Handley Page Ltd, Claremont Road, Cricklewood, London NW2. T: Gladstone 8000.
Hants & Sussex Aviation Ltd, The Airport, Portsmouth, Hants. T: Portsmouth 63051.
Hardy Spicer Ltd, Chester Road, Erdington, Birmingham 24. T: Erdington 2191.
Harley Aircraft Landing Lamps, Paxton Hill, St Neots, Hunts. T: St Neots 230.
Harleyford Publications Ltd, Letchworth, Herts.
Harringay Photographic & Electrical Supplies Ltd, 423 Green Lanes, London N4. T: Mountview 5241.
Harvey & Co (London) Ltd, G. A., Woolwich Road, London SE7. T: Greenwich 3232.
Hatton Jewellery & Watch Co Ltd, 26-27 Hatton Garden, London EC1. T: Chancery 4966.
Hawley Products Ltd, Cheney Manor, Swindon, Wilts. T: Swindon 6251.
Heenan & Froude Ltd, Shrub Hill Road, Worcester. T: Worcester 23461.
Heinemann Ltd, William, 15 Queen Street, London W1. T: Hyde Park 4141.
Helicopter Sales Ltd, 2 Lowndes Street, London SW1. T: Belgravia 6477.
Helicopter Services Ltd, 96 Piccadilly, London W1. T: Grosvenor 5495.
Hellermann Ltd, Gatwick Road, Crawley, Sussex. T: Crawley 2000.
Henderson Safety Tank Co Ltd, 2 Elstree Way, Boreham Wood, Herts. T: Elstree 1758.
Hendrey Relays Ltd, 392 Bath Road, Slough, Bucks. T: Burnham 609.
Henshall & Sons (Addlestone) Ltd, W., Abbot Close, Oyster Lane, Byfleet, Surrey. T: Byfleet 42271.
Hepworth & Grandage (Yeadon) Ltd, Victoria Avenue, Yeadon, nr Leeds, Yorks. T: Rawdon 3225.
Heston Aircraft & Associated Engineers Ltd, Heston Airport, Hounslow, Middx. T: Hayes 3844.
Heywood & Co Ltd, Drury House, Russell Street, London WC2. T: Temple Bar 3422.
Hickman Ltd (Sheet Metal Division), North Circular Road, London NW2. T: Gladstone 6262.
High Duty Alloys Ltd, Slough, Bucks. T: Slough 23901.
High Pressure Components Ltd, Sunflex Works, Colham Mill Road, West Drayton, Middx. T: West Drayton 2226.
Hobson Ltd, H. M., Hobson Works, Fordhouses, Wolverhampton. T: Fordhouses 2381.
Hodder & Stoughton Ltd, Warwick Square, London EC4. T: City 7775.
Hoffmann Manufacturing Co Ltd, PO Box 7, Chelmsford, Essex. T: Chelmsford 3151.
Holman & Co (Engineers) Ltd, 183 Fordneuk Street, Glasgow SE. T: Bridgeton 2227.
Honeywell Controls Ltd, Greenford, Middx. T: Waxlow 2333.
Hordern Richmond Ltd, Bristol Road, Gloucester. T: Gloucester 24941.
Houchin Ltd, Garford Works, Chart Road, Ashford, Kent. T: Ashford 1701.
Hughes-Johnson Stampings Ltd, The, Langley Green, Birmingham. T: Broadwell 1361.
Hunting Mhoglas Ltd, The Airport, Luton, Beds. T: Luton 6060.
Hunting Surveys Ltd, 6 Elstree Way, Boreham Wood, Herts. T: Elstree 2214.
Hutchinson & Co (Publishers) Ltd, 178 Great Portland Street, London W1. T: Langham 3020.
Hycrome Ltd, Thomas Street Works, Colne, Lancs. T: Colne 249.
Hydraulics & Pneumatics Ltd, Wulfruna Works, Villiers Street, Wolverhampton. T: Wolverhampton 24456.
Hymatic Engineering Co Ltd, The, Glover Street, Redditch, Worcs. T: Redditch 3621.

I.C.I. (Hyde) Ltd, Newton Works, Hyde, Cheshire. T: Hyde 2651.
I.V. Pressure Controllers Ltd, Atlas House, 683 London Road, Isleworth, Middx. T: Isleworth 7273.
Ilford Ltd, Ilford, Essex. T: Ilford 3000.
Imhof Ltd, Alfred, Ashley Works, Cowley Mill Road, Uxbridge, Middx. T: Uxbridge 37123.
Imperial Aluminium Co Ltd, PO Box 216, Kynoch Works, Witton, Birmingham 6. T: Birchfields 6261.
Imperial Chemical Industries Ltd, Imperial Chemical House, Millbank, London SW1. T: Victoria 4444.
Industrial Leather Products Ltd, Gatwick House, Horley, Surrey. T: Horley 4455.
Infra Red Development Co Ltd, The, 40 Tewin Road, Welwyn Garden City, Herts. T: Welwyn Garden 25591.
Integral Ltd, Birmingham Road, Wolverhampton. T: Wolverhampton 24984.
International Aeradio Ltd, 40 Park Street, London W1. T: Hyde Park 5024.
International Nickel Co (Mond) Ltd, The, Thames House, Millbank, London SW1. T: Victoria 3888.
Irving Air Chute of Great Britain Ltd, Icknield Way, Letchworth, Herts. T: Letchworth 888.
Iso-Speedic Co Ltd, The, Charles Street, Warwick. T: Warwick 1034.
Isopad Ltd, Barnet By-pass, Boreham Wood, Elstree, Herts. T: Elstree 2817.

Jablo Propellers Ltd, Jablo Works, Mill Lane, Waddon, Croydon, Surrey. T: Croydon 2201.
Jarrolds Publishers (London) Ltd, 178 Great Portland Street, London SW1. T: Langham 3020.
Jessop-Saville Ltd, Brightside Works, Sheffield. T: Sheffield 41352.
Jessop-Saville (Small Tools) Ltd, Eastwood Works, Fitzwilliam Works, Rotherham, Yorks. T: Rotherham 77171.

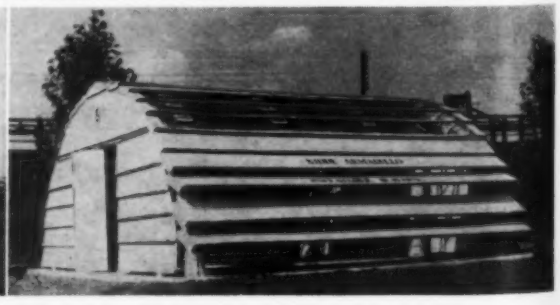
K.L.G. Aviation Products—*see* Smiths Aviation Division.
Kane (Sealants) Ltd, Douglas, 243 Upper Street, London N1. T: Canonbury 8646.
Kautex Ltd, Elstree Way, Boreham Wood, Herts. T: Elstree 1777.
Kaye Ltd, E. & E., Ponders End, Enfield, Middx. T: Howard 1601.
Kaylee Transfers Ltd, PO Box 11, Progress Works, New Tythe Street, Long Eaton, Nottingham. T: Long Eaton 3985.
Kayser, Ellison & Co Ltd, Carlisle Steel Works, Sheffield 4. T: Sheffield 22124.
Kelvin Hughes Ltd—*see* Smiths Aviation Division.
Kenilworth Manufacturing Co Ltd, The, Hermetite Works, West Drayton, Middx. T: West Drayton 3731.
Kent Alloys Ltd, Temple Manor Works, Rochester, Kent. T: Strood 7674.
Kent Ltd, George, Biscot Road, Luton, Beds. T: Luton 2440.
Ketay Ltd, Eddes House, Eastern Avenue West, Romford, Essex. T: Seven Kings 6050.

The new Hymatic RV.63 dual inward/outward vent valve for pressure control of fuel tanks

Kidde Co Ltd, The Walter, Belvue Road, Northolt, Middx. T: Viking 6611.
King Aircraft Corporation, Cameron Street, Hillington, Glasgow SW2. T: Halfway 4571.
Kiveton Park Steel & Wire Works Ltd, Kiveton Park, nr Sheffield. T: Kiveton 252.
Kodak Ltd, Kodak House, Kingsway, London WC2. T: Holborn 7841.

Lacre Ltd, Hatfield Road, St Albans, Herts. T: St Albans 55471.
Lancefield Aircraft Components Ltd, Herries Street, London W10. T: Ladbroke 2951.
Langham Thompson Ltd, J., 176 High Road, Bushey Heath, Herts. T: Bushey Heath 2411.
Lansing Bagnall Ltd, Kingsclere Road, Basingstoke, Hants. T: Basingstoke 1010.
Laporte Chemicals Ltd, PO Box 8, Luton, Beds. T: Luton 4390.
Latex Upholstery Ltd, 41 Lonsdale Road, London W11. T: Bayswater 6262.
Laycock Engineering Ltd, Victoria Works, Millhouses, Sheffield 8. T: Sheffield 74411.
Lea Bridge Industries Ltd (and Associated Companies), Priory Works, Arterial Road, Southend-on-Sea, Essex. T: Eastwood 525265.
Lec Refrigeration Ltd, Bognor Regis, Sussex. T: Bognor Regis 2201.
Lentern (Aircraft) Ltd, Main Road, Hawkwell, Hockley, Essex, and 324-325 Grand Buildings, Trafalgar Square, London WC2. T: Hockley 353 and Whitehall 5005.
Lep Transport Ltd, Sunlight Wharf, Upper Thames Street, London EC4. T: Central 5050.
Lewis Ltd, D, 124 Great Portland Street, London W1. T: Museum 4314.
Leytonstone Jig & Tool Co Ltd, Leytool Works, High Road, Leyton, London E10. T: Leytonstone 5022.
Light-Metal Forgings Ltd, Churchbridge, Oldbury, Birmingham. T: Broadwell 1152.

Inflatable-tube framework of one of the Walter Kidde portable buildings and (right) the same company's semi-permanent "Armadillo" structure



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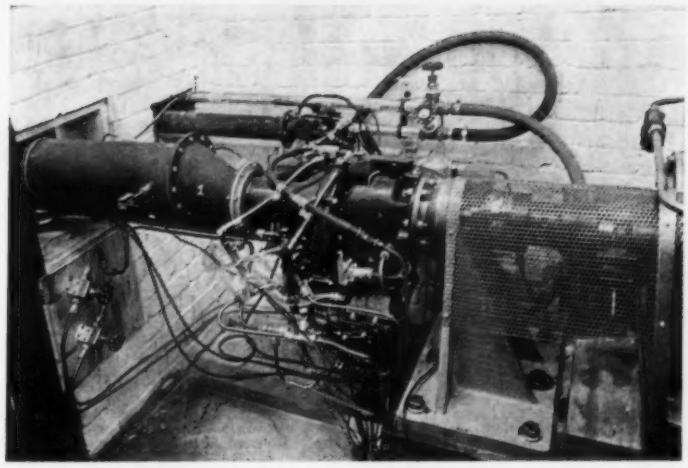
ANCILLARY INDUSTRY 1961 ...

Light Soldering Developments Ltd, 28 Sydenham Road, Croydon, Surrey. T: Croydon 8589.
Lockheed Precision Products Ltd, Tachbrook Road, Leamington Spa, Warwicks, and Shaw Road, Speke, Liverpool. T: Leamington Spa 2700 and Hunts Cross 2121.
Lodge Plugs Ltd, St Peters Road, Rugby, Warwicks. T: Rugby 2166.
Low Moor Alloy Steelworks Ltd, New Works Road, Low Moor, Bradford, Yorks. T: Bradford 77331.
Low Moor Fine Steels Ltd, New Works Road, Low Moor, Bradford, Yorks. T: Bradford 77331.
Lucas Ltd, Joseph, Great King Street, Birmingham 19. T: Northern 5252.
Lucas Gas Turbine Equipment Ltd, Shaftmoor Lane, Birmingham 28. T: Springfield 3232.

M.B. Metals Ltd, Vale Works, Portslade, Sussex. T: Hove 46275.
M.L. Aviation Co Ltd, White Waltham Aerodrome, Maidenhead, Berks. T: Littlewick Green 248.
McAlpine Aviation (Aviation Division of Sir Robert McAlpine & Sons Ltd), Luton Airport, Luton, Beds. T: Luton 8073.
McMichael Radio Ltd, Wexham Road, Slough, Bucks. T: Slough 24541.
Macready's Metal Co Ltd, Usaspead Corner, Pentonville Road, London N1. T: Terminus 7060.
Magnesium Elektron Ltd, PO Box 6, Lumms Lane, Clifton Junction, Swinton, Manchester. T: Swinton 2511.
Mallinson & Sons Ltd, William, Thames Road, Crayford, Kent. T: Crayford 26244.
Mallock-Armstrong Co, The, 7 Millmead, Guildford, Surrey. T: Guildford 66488.
Manchester Oil Refinery (Sales) Ltd, 76 Jermyn Street, London SW1. T: Whitehall 8411.
Marconi Instruments Ltd, St Albans, Herts. T: St Albans 59292.
Marconi's Wireless Telegraph Co Ltd, Marconi House, Chelmsford, Essex. T: Chelmsford 3221.
Marston Excelsior Ltd, Wobaston Road, Fordhouses, Wolverhampton. T: Fordhouses 3361.
Martin-Baker Aircraft Co Ltd, Higher Denham, nr Uxbridge, Middx. T: Denham 2214.
Mastermodels Ltd, Greenhill Crescent, Harrow, Middx. T: Harrow 2428.
Mayday Equipment Ltd, David Street, Industrial Estate, Bridgend, Glam. T: Bridgend 2852.
Measuring Instruments (Pullin) Ltd, Electrin Works, Winchester Street, Acton, London W3. T: Acorn 4651.
Mechanism Ltd, Gyro Works, George Street, Croydon, Surrey. T: Croydon 3426.
Mercury Airfield Equipment Ltd, The Quay, Gloucester. T: Gloucester 24451.
Mercury Truck & Tractor Co Ltd, The, The Quay, Gloucester. T: Gloucester 24451.
Meridian Airmaps Ltd, Shoreham Airport, Sussex. T: Shoreham 2366.
Metachemical Processes Ltd, 41, 43, 47 Gatwick Road, Crawley, Sussex. T: Crawley 25241.
Micanite & Insulators Co Ltd, The, Empire Works, Blackhorse Lane, Walthamstow, London E17. T: Larkswood 5500.
Microcell Ltd, 9 Kingsway, London WC2. T: Covent Garden 1262.
Middleton Sheet Metal Co Ltd, Spring Vale Works, Spring Vale, Middleton, Manchester. T: Middleton 2462.
Midland Aeroquipment Ltd, Park Road, Bloxwich, nr Walsall, Staffs. T: Bloxwich 76414.



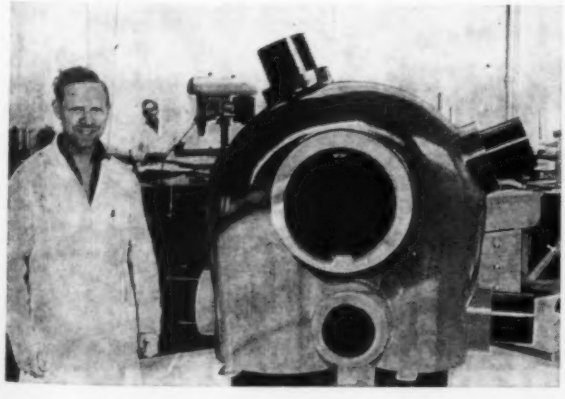
Cabin air compressor for the Transall C160 on test by Normalair Ltd. It incorporates fully automatic, built-in flow and surge control and a 2 speed gear box

Miles Electronics Ltd, The Airport, Shoreham-by-Sea, Sussex. T: Shoreham-by-Sea 4377.
Miles Engineering Ltd, F. G., Riverbank Works, Old Shoreham Road, Shoreham-by-Sea, Sussex. T: Shoreham-by-Sea 4301.
Miles Hivolt Ltd, Riverbank Works, Old Shoreham Road, Shoreham-by-Sea, Sussex. T: Shoreham-by-Sea 4301.
Miles Marine & Structural Plastics Ltd, Ford, nr Arundel, Sussex. T: Littlehampton 1259.
Miles Ltd, Alf'd, Brockworth, Gloucester. T: Gloucester 67011.
Miller Aviation Ltd, Adastral House, Nutfield, Redhill, Surrey. T: Redhill 5050.
Mills Ltd, William, Friar Park Road, Wednesbury, Staffs. T: Stone Cross 2651.
Mining & Chemical Products Ltd, 86 Strand, London, WC2. T: Covent Garden 3393.
Mitchell Hydraulics Ltd, Albert Drive, Sheerwater, Woking, Surrey. T: Woking 4680.
Mollart Engineering Co Ltd, Kingston By-pass, Surbiton, Surrey. T: Elmbridge 0033.
Monsanto Chemicals Ltd, Monsanto House, 10-18 Victoria Street, London SW1. T: Abbey 5678.
Morfax Ltd, Willow Lane, Mitcham, Surrey. T: Mitcham 4525.
Muirhead & Co Ltd, Beckenham, Kent. T: Beckenham 4888.
Mullard Equipment Ltd, Mullard House, Torrington Place, London WC1. T: Langham 6633.
Mullard Ltd, Mullard House, Torrington Place, London WC1. T: Langham 6633.
Munro Ltd, R. W., Bounds Green, London N11. T: Enterprise 4422.
Murex Welding Processes Ltd, Waltham Cross, Herts. T: Waltham Cross 23636.
Murphy Radio Ltd, Electronics Division, Welwyn Garden City, Herts. T: Welwyn Garden 23434.

Napier & Son Ltd, D., 211 The Vale, Acton, London W3. T: Shepherds Bush 1220.
Negretti & Zambra Ltd, 122 Regent Street, London W1. T: Regent 3406.
Newalls Insulation Co Ltd, Washington, County Durham. T: Washington 3333.
Newmark Ltd, Louis, Prefect Works, Purley Way, Croydon, Surrey. T: Croydon 5571.
Newnes Ltd, George, Tower House, Southampton Street, London WC2. T: Temple Bar 4363.
Newton & Co Ltd, H. T., London (Gatwick) Airport, Surrey. T: Livingstone 8811.
Newton Bros (Derby) Ltd, Alfreton Road, Derby. T: Derby 47676.
Normalair Ltd, Yeovil, Somerset. T: Yeovil 1100.
Norstel & Templewood Hawksley Ltd, 2 Buckingham Avenue, Slough, Bucks. T: Slough 26911.
Northern Rubber Co Ltd, The, Victoria Works, Retford, Notts. T: Retford 256.

Oddie, Bradbury & Cull Ltd, Portswood Road, Southampton. T: Southampton 55883.
Oldham & Son Ltd, Denton, Manchester. T: Denton 2431.
Omes Ltd, Beverley Works, Barnes, London SW13. T: Prospect 2291.
Opperman Ltd, S. E., Boreham Wood, Herts. T: Elstree 2021.
Optical Measuring Tools Ltd, 142 Bridge Road, Maidenhead, Berks. T: Maidenhead 3704.
Orchard & Ind Ltd, Northgate Street, Gloucester. T: Gloucester 23091.

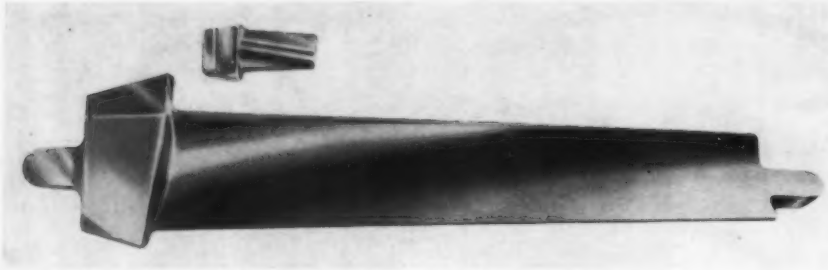
Page Engineering Co (Sunbury on Thames) Ltd, Page Works, Forge Lane, Sunbury on Thames, Middx. T: Sunbury on Thames 4242.
Palmer Aero Products Ltd, Herga House, Vincent Square, London SW1. T: Victoria 3848.
Park Gate Iron & Steel Co Ltd, Park Gate Works, PO Box 23, Rotherham, Yorks. T: Rotherham 2141.
Park Ltd, R. & J., Dominion Works, Thames Road, Chiswick, London W4. T: Chiswick 7761.
Parker (Aircraft Spares) Ltd, W. A., Manor Trading Estate, Church Road, Thundersley, Essex. T: South Benfleet 2681.
Parnall & Co Ltd, The Causeway, Fishponds, Bristol. T: Bristol 654261.
Parsons & Co Ltd, S., St Georges Ironworks, Young Street, Bradford 8. T: Bradford 45494.



Left, pattern for a large blower casing, by the pattern-making department of Mastermodels Ltd

Below, flight information display from screen of Marconi tabular display unit Type SD 1016. The equipment is described, and illustrated in use, on page 328

C. SIGN	LEVEL	CLA	BKP	WAT	EGLL
G AHOP	270	1013	1019	1020	1021
G AXBY	300	1040	1046	1047	1049
LH 432	210	1045	1051	1053	1055
SK 502	190	1050	1056	1057	1059
SN 567	230	1056	1102	1104	1106
EM 534	270	1102	1107	1108	1110
BA 704	180	1110	1115	1117	1120



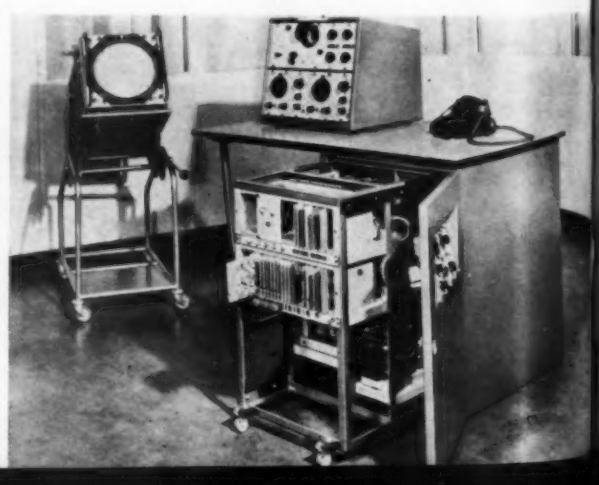
Contrasts in turbine-blade sizes by Precision Forgings Ltd. The larger blade, forged to finished dimensions, is 12½in long

ANCILLARY INDUSTRY 1961...

Partridge, Wilson & Co Ltd, Davenset Electrical Works, Evington Valley Road, Leicester. T: Leicester 37291.
Peradin Rubber Co Ltd, Freshford Mill, Freshford, nr Bath, Somerset. T: Limpley Stoke 3263.
Petbow Ltd, Sandwich, Kent. T: Sandwich 3311.
Petbow Ltd (Liverpool Works), Dixon Road, Kirkby Industrial Estate, nr Liverpool. T: Simonswood 3261.
Peto & Radford Ltd, 137 Victoria Street, London SW1. T: Tate Gallery 9212.
Phillips & White Ltd, 61 Queen's Gardens, London W2. T: Ambassador 2764.
Pitman & Sons Ltd, Sir Isaac, 39 Parker Street, London WC2. T: Holborn 9791.
Plannair Ltd, Windfield House, Leatherhead, Surrey. T: Leatherhead 4091.
Plessey Co Ltd, The, Ilford, Essex. T: Ilford 3040.
Plessey Nucleonics Ltd, Weedon Road, Northampton. T: Northampton 4966.
Portsmouth Aviation Ltd, The Airport, Portsmouth, Hants. T: Portsmouth 62251.
Power Auxiliaries Ltd, Kembrey Street, Swindon, Wilts. T: Swindon 6211.
Power Flexibile Tubing Co Ltd, The, Derby Works, Vale Road, London N4. T: Stamford Hill 6696.
Power Jets (Research & Development) Ltd, 25 Green Street, London W1. T: Mayfair 7801.
Precision Forgings Ltd, Newton Works, Bromsgrove, Worcs. T: Bromsgrove 2621.
Precision Rubbers Ltd, Bagworth, Leicester. T: Bagworth 361.
Pritchett & Gold and E.P.S. Co Ltd, Dagenite Works, Dagenham Dock, Essex. T: Dominion 0121.
Proops Bros Ltd, 52 Tottenham Court Road, London W1. T: Langham 0141.
Pullin & Co Ltd, R. B., Phoenix Works, Great West Road, Brentford, Middx. T: Isleworth 1212.
Purefoy Unit Tooling Ltd, Upper Tilt Works, Cobham, Surrey. T: Cobham 3013.
Putnam & Co Ltd, 42 Great Russell Street, London WC1. T: Museum 7045.
Pye Telecommunications Ltd, Newmarket Road, Cambridge. T: Teversham 3131.
Pyrene Co Ltd, The, 9 Grosvenor Gardens, London SW1. T: Victoria 8474.

R.F.D. Co Ltd, Catteshall Lane, Godalming, Surrey. T: Godalming 1441.
R.H. Lighting Ltd, Anyards Road, Cobham, Surrey. T: Cobham 3817.
R.M.R. Engineering, Brook Street, Tring, Herts. T: Tring 3338.
Racal Engineering Ltd, Western Road, Bracknell, Berks. T: Bracknell 941.
Rank Cintel Ltd, Worsley Bridge Road, London SE26. T: Hither Green 4600.
Ransome & Marles Bearing Co Ltd, Newark-on-Trent, Notts. T: Newark 456.
Rapp Ltd, Leo, Wimborne Avenue, Norwood Green, Southall, Middx. T: Southall 2322.
Ratcliffe (Rochdale) Ltd, F. S., Crawford Spring Works, Norman Road, Rochdale, Lancs. T: Rochdale 40415.
Rawlplug Co Ltd, The, Rawlplug House, Cromwell Road, London SW7. T: Fremantle 8111.
Redifon Ltd, Broomhill Road, Wandsworth, London SW18. T: Vandyke 7281.
Redwing Ltd, 340 Bensham Lane, Thornton Heath, Surrey. T: Thornton Heath 3663.
Regent Oil Co Ltd, 117 Park Street, London W1. T: Mayfair 8474.
Reid & Sigrist Ltd, Braunstone Works, Golf Course Lane, off Hinckley Road, Braunstone, Leicester. T: Leicester 858101. (Also 9 Albert Embankment, London SE11.)
Rellumit (London) Ltd, Chandos House, Palmer Street, London SW1. T: Abbey 3304.
Renamel (A.I.D.) Ltd, 10 Kilburn High Road, London NW6. T: Maida Vale 9194.
Renold Chains Ltd, Renold House, Wythenshawe, Manchester. T: Mercury 5221.
Reynolds (Packaging) Ltd, Alfred's Way, Barking, Essex. T: Rippleway 3586.
Reynolds Tube Co Ltd, Hay Hall Works, Tyseley, Birmingham 11. T: Acocks Green 3333.
Riley Ltd, Robert, Milkstone Spring Works, Mere Lane, Rochdale, Lancs. T: Rochdale 2237.
Rist's Wires & Cables Ltd, Lower Milehouse Lane, Newcastle, Staffs. T: Newcastle 51221.
Robinson & Co (Gillingham) Ltd, L., London Chambers, Gillingham, Kent. T: Gillingham 51182.
Robinson & Partners Ltd, F. C., Councillor Lane, Cheadle, Cheshire. T: Gatley 2469.
Rogers (Aviation) Ltd, W. H. & J., Great Barford, Bedford. T: Great Barford 201.
Rollason Aerocessories Ltd, Croydon Airport, Croydon, Surrey. T: Croydon 7238.
Rollason Aircraft & Engines Ltd, Croydon Airport, Croydon, Surrey. T: Croydon 5151.
Rollet & Co Ltd, H., 6 Chesham Place, London SW1. T: Belgravia 4300.
Rolls-Royce Ltd, PO Box 31, Derby. T: Derby 42424.
Rose Bros (Gainsborough) Ltd, Albion Works, Gainsborough, Lincs. T: Gainsborough 2231.
Ross, Courtney & Co Ltd, 25 Ashbrook Road, Upper Holloway, London N19. T: Archway 1166.
Ross Ltd, S. Grahame, Quarry Lane Works, Whyke, Chichester, Sussex. T: Chichester 2453.
Rotax Ltd, Chandos Road, Willesden Junction, London NW10. T: Elgar 7777.
Rover Gas Turbines Ltd, Meteor Works, Lode Lane, Solihull, Warwicks. T: Sheldon 4242.
Royston Instruments Ltd, Canada Road, Byfleet, Surrey. T: Byfleet 42211.
Rozalex Ltd, 10 Norfolk Street, Manchester 2. T: Blackfriars 1122.
Rubery Owen & Co Ltd, Bolt and Nut Division, Darlaston, Staffs. T: James Bridge 3131.
Rumbold & Co Ltd, L. A., Kingsgate Place, Kilburn, London NW6. T: Maida Vale 7366.

SPE Co Ltd, Edinburgh Avenue, Slough, Bucks. T: Slough 23277.
Salford Electrical Instruments Ltd, Peel Works, Silk Street, Salford 3. T: Blackfriars 6688.
Salter & Co Ltd, Geo., High Street, West Bromwich, Staffs. T: West Bromwich 1855.
Samlesbury Engineering Ltd, Samlesbury Airfield, nr Blackburn, Lancs. T: Mellor 666.
Sampson Low, Marston & Co Ltd, 25 Gilbert Street, London W1. T: Mayfair 9771.
Sanders (Electronics) Ltd, W. H., Gunnels Wood Road, Stevenage, Herts. T: Stevenage 981. (Also 49 Conduit Street, London W1.)
Sangamo Weston Ltd, Great Cambridge Road, Enfield, Middx. T: Enfield 3434.
Sankey & Sons Ltd, Joseph, Albert Street, Bilston, Staffs. T: Bilston 41161.
Saro (Anglesey) Ltd, Beaumaris, Anglesey, North Wales. T: Beaumaris 130.
Saunders Valve Co Ltd, Blackfriars Street, Hereford. T: Hereford 3125.
Savage Ltd, W. Bryan, 17 Stratton Street, London W1. T: Grosvenor 1926.
Saywell Ltd, R. F., Gatwick Airport South, Horley, Surrey. T: Livingstone 8811 and Horley 5511.
Scanrad Ltd, Adastral House, Nutfield, nr Redhill, Surrey. T: Redhill 5050.
Schermuly Pistol Rocket Apparatus Ltd, The, 51 Coleman Street, London EC2. T: Monarch 9307.
Sciaky Electric Welding Machines Ltd, Falmouth Road, Trading Estate, Slough, Bucks. T: Slough 25551.
Scotney Ltd, Tom M., London Road, St Ives, Huntingdon. T: St Ives 2421.
Scottish Aviation Ltd, Prestwick Airport, Ayrshire. T: Prestwick 79888.
Searle Ltd, R. J., Thames Street, Sunbury-on-Thames, Middx. T: Sunbury-on-Thames 3014.
Secker & Warburg, 7 John Street, London WC2. T: Chancery 6486.
Semiconductors Ltd, Cheney Manor, Swindon, Wilts. T: Swindon 6421.
Serck Radiators Ltd, Warwick Road, Birmingham 11. T: Victoria 4353.
Shackleton (Aviation) Ltd, W. S., 175 Piccadilly, London W1. T: Hyde Park 2448.
Shawcraft (Models) Ltd, 69 Rockingham Road, Uxbridge, Middx. T: Uxbridge 35593.
Sheffield Smelting Co Ltd, The, Royds Mill Street, Sheffield 4. T: Sheffield 26511.
Shell-Mex & BP Ltd, Shell-Mex House, Strand, London WC2. T: Temple Bar 1234.
Short Bros & Harland Ltd, Queen's Island, Belfast, Northern Ireland. T: Belfast 58444.
Siebe, Gorman & Co Ltd, Neptune Works, Davis Road, Chessington, Surrey. T: Elmbridge 5900.
Silentbloc Ltd, Manor Royal, Crawley, Sussex. T: Crawley 2100.
Simmonds Aerocessories Ltd, 7 Cleveland Row, St James's, London SW1. T: Whitehall 3100.
Simmons & Hawker Ltd, North Feltham Trading Estate, Central Way, Feltham, Middx. T: Feltham 3631.
Simon Engineering Dudley Ltd, Queens Cross, Dudley, Worcs. T: Dudley 54661.
Skefko Ball Bearing Co Ltd, The, Luton, Beds. T: Luton 5700.
Skyhi Ltd, Pulsometer House, 20-26 Lamb's Conduit Street, London WC1. T: Holborn 1402.
Skyways Ltd, Stansted Airport, Stansted, Essex. T: Bishop's Stortford 1641. (Also 7 Berkeley Street, London W1.)
Smart & Brown (M.T.) Ltd, 25 Manchester Square, London W1. T: Welbeck 7941.
Smith & Son Ltd, W. H., Strand House, Portugal Street, London WC2. T: Holborn 4343.
Smith Ltd, Herman, Reliance Works, Dudley, Worcs. T: Dudley 52711.
Smith-Clayton Forge Ltd, Tower Works, Lincoln. T: Lincoln 25492.
Smiths Aviation Division, Kelvin House, Wembley Park Drive, Wembley, Middx. T: Wembley 8888.
Smith's Stamping Works (Coventry) Ltd, Ribble Road Works, Humber Avenue, Coventry. T: Coventry 52271.
Solartron Electronic Group Ltd, The, Victoria Road, Farnborough, Hants. T: Farnborough 3000.
Solus-Schall Ltd, County Building, Honeypot Lane, Stanmore, Middx. T: Wordsworth 4300.
Somers Ltd, J. N., 142-148 Edgware Road, London W2. T: Paddington 7661.
Southern Forge Ltd, Meadfield Road, Langley Bucks. T: Langley 301.
Southern Instruments Ltd, Frimley Road, Camberley, Surrey. T: Camberley 3401.
Spa Guilds Ltd, St James's Square, Cheltenham, Glos. T: Cheltenham 53312.
Sparklets Products, British Oxygen Co Ltd, Queen Street, Tottenham, London N17. T: Tottenham 0881.
Specto Ltd, Vale Road, Windsor, Berks. T: Windsor 1241.
Sperry Gyroscope Co Ltd, Great West Road, Brentford, Middx. T: Isleworth 1241.
Spring Washers Ltd, Wobaston Road, Fordhouses, Wolverhampton. T: Fordhouses 2176.

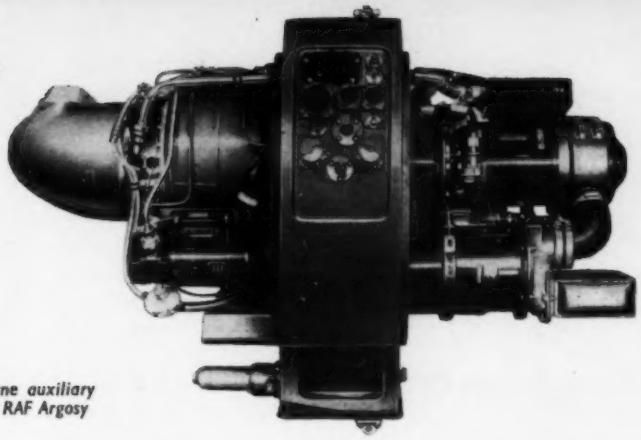


Solartron transistorized radar simulator, showing access to interior equipment

ANCILLARY INDUSTRY 1961...

Spurling Motor Bodies Ltd, Edgware Road, The Hyde, London NW9. T: Colindale 7171.
Standard Telephones & Cables Ltd, Therese House, 29-30 Glasshouse Yard, Aldersgate Street, London EC1. T: Clerkenwell 4511.
Staravia Ltd, Redfields Works, Church Crookham, Near Aldershot, Hants. T: Fleet 1383.
Steatite & Porcelain Products Ltd, Bewdley Road, Stourport-on-Severn, Worcs. T: Stourport 2271.
Steel, Peech & Tozer, PO Box 50, The Ickles, Rotherham, Yorks. T: Rotherham 2181.
Steel Stampings Ltd, Cookley, nr Kidderminster, Worcs. T: Wolverley 266.
Step Industrial Equipment Ltd, Lower Kings Road, Berkhamsted, Herts. T: Berkhamsted 62.
Sterling Metals Ltd, Gipsy Lane, Nuneaton, Warwicks. T: Nuneaton 4221.
Stewart Aeronautical Supply Co Ltd, The, Adastral House, Nutfield, nr Redhill, Surrey. T: Redhill 5050.
Stream-Line Filters Ltd, Henley Park, Normandy, nr Guildford, Surrey. T: Normandy 3311.
Stone & Co (Charlton) Ltd, J., Woolwich Road, Charlton, London SE7. T: Greenwich 3277.
Stone & Co (Deptford) Ltd, J., Arklow Road, London SE14. T: Tideway 1202.
Stone-Chance Ltd, Gatwick Road, Crawley, Sussex. T: Crawley 25251.
Stuart (London) Ltd, Robert, 10 Ascham Street, Kentish Town, London NW5. T: Gulliver 6141.
Suntex Safety Glass Industries Ltd, Suntex Estate, Thorney Lane, Iver, Bucks. T: Uxbridge 34970.
Super Oil Seals & Gaskets Ltd, Birmingham Factory Centre, King's Norton, Birmingham. T: King's Norton 2041.
Surridge's Patents Ltd, New Works, Croydon Road, Beckenham, Kent. T: Beckenham 0168.
Sutton (Consultants) Ltd, R. W., 7 Lansdown Place, Cheltenham, Glos. T: Cheltenham 5811.

T.E.M. Engineering Ltd, Gatwick Road, Crawley, Sussex. T: Crawley 2350.
T.K.S. (Aircraft De-Icing) Ltd, Drayton House, Gordon Street, London WC1. T: Euston 4650.
Talbot Stead Tube Co Ltd, Green Lane, Walsall, Staffs. T: Walsall 21222.
Taylor (Metal Workers) Ltd, C. F., Molly Millars Lane, Wokingham, Berks. T: Wokingham 1005.
Taylor (Plastics) Ltd, C. F., Kings Road, Crowthorne, Berks. T: Crowthorne 2277.
Taylor, Taylor & Hobson (Division of Rank Precision Industries Ltd), Stoughton Street, Leicester. T: Leicester 23801.
Tecalemit Ltd, Plymouth, Devon, and Feltham, Middx. T: Plymouth 62844 and Feltham 3691.
Technical Ceramics Ltd, Wood Burcote Way, Towcester, Northants. T: Towcester 337.
Technical Platings Ltd, Craigs Works, Luther Road, Teddington, Middx. T: Teddington Lock 4381.
Technograph Electronic Products Ltd, Eros House, 29-31 Lower Regent Street, London SW1. T: Regent 5273.
Teddington Aircraft Controls Ltd, Cefn Coed, nr Merthyr Tydfil, Glam, South Wales. T: Merthyr Tydfil 3261.
Telcon Metals Ltd, Manor Royal, Crawley, Sussex. T: Crawley 1560.
Teleflex Products Ltd, Christopher Martin Road, Basildon, Essex. T: Basildon 22861.
Terry & Sons Ltd, Herbert, Redditch, Worcs. T: Redditch 4261.
Test Equipment Ltd, Gatwick Road, Crawley, Sussex. T: Crawley 2350.
Texas Instruments Ltd, Manton Lane, Bedford. T: Bedford 67466.
Thermal Control Co Ltd, Marine Works, Sackville Road, Hove, Sussex. T: Hove 35929.
Thermionic Products (Electronics) Ltd, Hythe, Southampton. T: Hythe 3265.
Thermo-Plastics Ltd, Luton Road Works, Dunstable, Beds. T: Dunstable 64255.
Thompson Bros (Bilston) Ltd, Bradley Engineering Works, Bilston, Staffs. T: Bilston 41264.
Thompson (Engineers) Ltd, Raymond F., Harlow, Essex. T: Harlow 24341.
Thorn Electrical Industries Ltd (Special Products Division), Great Cambridge Road, Enfield, Middx. T: Enfield 5353.
Tiltman Langley Ltd, Redhill Aerodrome, Surrey. T: Nutfield Ridge 2202.
Titanine Ltd, Sheaveshill Avenue, Colindale, London NW9. T: Colindale 8123.
Titanium Metal & Alloys Ltd, 2 Metal Exchange Buildings, Leadenhall Avenue, London EC3. T: Mansion House 4521.
Torrington Co Ltd, The, Bearings Division, Torrington Avenue, Coventry. T: Coventry 74241.
Transport Equipment (Thorneycroft) Ltd, Worting Road, Basingstoke, Hants. T: Basingstoke 1200.
Transport Seating Ltd, Western Works, Bromley Street, Birmingham 9. T: Victoria 5901.
Triplex Safety Glass Co Ltd, 1 Albemarle Street, Piccadilly, London W1. T: Hyde Park 8171.
Trist & Co Ltd, Ronald, Bath Road, Slough, Bucks. T: Slough 25041.
Trix Electronics Ltd, Maple Place, Tottenham Court Road, London W1. T: Museum 5817.
Trucast Ltd, Farnham Royal Lodge, Bucks. T: Farnham Common 650.
Truro Engine Works Ltd, Morden Road, London SW19. T: Cherrywood 3361.
Tubes Ltd, Aston, Birmingham 6. T: Aston Cross 3030.



A Rover airborne auxiliary powerplant for RAF Argosy

Tucker Eyelet Co Ltd, Geo., Walsall Road, Birmingham 22B. T: Birchfields 4811.
Tufnol Ltd, Perry Barr, Birmingham 22B. T: Birchfields 4554.
Tungum Co Ltd, The, White House, Arle, Cheltenham, Glos. T: Cheltenham 5855.
Turner Bros Asbestos Co Ltd, Rochdale, Lancs. T: Rochdale 4221.
Turner Electrical Instruments Ltd, Chiltern Works, Totteridge Avenue, High Wycombe, Bucks. T: High Wycombe 1301.

Ultra Electronics Ltd, Western Avenue, Acton, London W3. T: Acorn 3434.
Unbrako AD (Advanced Design Division of Unbrako Socket Screw Co Ltd), PO Box 38, Burnaby Road, Coventry. T: Coventry 89471.
United Coke & Chemicals Co Ltd, PO Box 136, Sales Department, Handsworth, Sheffield 13. T: Woodhouse 3211.
United Steel Companies Ltd, The, PO Box 64, The Mount, Broomhill, Sheffield 10. T: Sheffield 60081.
Universal Flying Services Ltd, Fair Oaks Aerodrome, Chobham, Surrey. T: Chobham 375.

V.P. Sheet Metal Ltd, 29 Windsor Street, Cheltenham, Glos. T: Cheltenham 5805.
Vactric Control Equipment Ltd, 30 Bouverie Street, London EC4. T: Ludgate Circus 7061.
Vactric Precision Tools Ltd, 30 Bouverie Street, London EC4. T: Ludgate Circus 7061.
Van Moppes & Sons (Diamond Tools) Ltd, L. M., Basingstoke, Hants. T: Basingstoke 1240.
Vandervell Products Ltd, Western Avenue, Acton, London W3. T: Acorn 2251.
Vandyke Engineering Ltd, Pinnacles, Harlow, Essex. T: Harlow 24652.
Valay- Industries Ltd, Davis Road, Chessington, Surrey. T: Lower Hook 2166.
Vane & Co Ltd, A. H., Iando House, 43 Bartholomew Close, London EC1. T: Metropolitan 9201.
Varley Dry Accumulators Ltd, By-Pass Road, Barking, Essex. T: Rippleway 3346.
Vaughan & Co Ltd, Edgar, Legge Street, Birmingham 4. T: Aston Cross 2071.
Vaughan Crane Co Ltd, The, West Gorton, Manchester 12. T: East 2771.
Venner Accumulators Ltd, Kingston By-Pass, New Malden, Surrey. T: Malden 2442.
Venner Electronics Ltd, Kingston By-Pass, New Malden, Surrey. T: Malden 2442.
Venner Ltd, Kingston By-Pass, New Malden, Surrey. T: Malden 2442.
Vigors Aviation Ltd, Oxford Airport, Kidlington, Oxford. T: Kidlington 3444.
Villiers (Tool Developments) Ltd, Waddens Brook Lane, Wednesfield, Staffs. T: Willenhall 2252. Also Villiers Engineering Co Ltd, Marston Road, Wolverhampton. T: Wolverhampton 22399.
Vinten Ltd, W., 715 North Circular Road, London NW2. T: Gladstone 6373.
Vokes Ltd, Henley Park, Guildford, Surrey. T: Guildford 62861.

Vosper Ltd, Portsmouth, Hants. T: Cosham 79481.
W.S. Electronics Ltd, Brunel Road, East Acton, London W3. T: Shepherds Bush 0331.
WAECO Ltd, Marine Division (Air/Sea Rescue), High Post, Salisbury, Wilts. T: Middle Woodford 282.
Walker & Co Ltd, James, Lion Works, Woking Surrey. T: Woking 2432.
Walterisation Co Ltd, The, Purley Way, Croydon, Surrey. T: Croydon 2791.
Ward, Brooke & Co Ltd, Westbourne Street, High Wycombe, Bucks. T: High Wycombe 4531.
Warden Aviation & Engineering Co, Old Warden Aerodrome, Biggleswade, Beds. T: Northill 288.
Waymouth Gauges & Instruments Ltd—*see* Smiths Aviation Division.
Wayne Kerr Laboratories Ltd, The, 44 Coombe Road, New Malden, Surrey. T: Malden 2202.
Wayne Tank & Pump Co Ltd, Western Road, Bracknell, Berks. T: Bracknell 1600.
Wellworthy Ltd, Lymington, Hants. T: Lymington 2231.
Western Manufacturing (Reading) Ltd, The Aerodrome, Reading, Berks. T: Sonning 2351.
Westinghouse Brake & Signal Co Ltd, 82 York Way, King's Cross, London N1. T: Terminus 6432.
Westland Aircraft Ltd, Saunders-Roe Division, Osborne, East Cowes, Isle of Wight. T: Cowes 2211.
Westway Models Ltd, 15-17 Brunel Road, East Acton, London W3. T: Shepherds Bush 7022.
Whitehouse Industries Ltd, Philidas Division, Monkhill, Pontefract, Yorks. T: Pontefract 2011.
Whiteley Electrical Radio Co Ltd, Victoria Street, Mansfield, Notts. T: Mansfield 1762.
Whittemore (Aeradio) Ltd, A. J., Biggin Hill Aerodrome, Westerham, Kent. T: Biggin Hill 2111.
Wiggin & Co Ltd, Henry, 20 Albert Embankment, London SE1. T: Victoria 3888.
Williams & James (Engineers) Ltd, Chequers Bridge, Gloucester. T: Gloucester 24021.
Williamson & Son Ltd, Jas., Lune Mills, Lancaster. T: Lancaster 5222.
Williamson Manufacturing Co Ltd, Hawthorn Road, Willesden, London NW10. T: Willesden 0073.
Wills Pressure Filled Joint Ring Ltd, Colley Lane, Bridgwater, Somerset. T: Bridgwater 4171.
Wilmot Breeden Ltd, Amington Road, Birmingham 25. T: Acocks Green 3344.
Wilmot Mansour Ltd, Nutsey Lane, Salisbury Road, Totton, nr Southampton. T: Totton 3621.
Wilson & Sons (London) Ltd, W., 114 Nightingale Road, Wood Green, London N22. T: Bowes Park 8431.
Wilson Alloys Ltd, 114 Nightingale Road, Wood Green, London N22. T: Bowes Park 8431.
Yorkshire Engineering Supplies Ltd, Upper Wortley Road, Leeds 12. T: Leeds 638234.
Z & I Aero Services Ltd, 14 South Wharf Road, London W2. T: Ambassador 0151.
Zwicky Ltd, 772-7 Buckingham Avenue, Trading Estate, Slough, Bucks. T: Slough 21201.

Display model of Vanguard by Westway Models Ltd

The location of Farnborough and the routes recommended by the motoring organizations. This Farnborough, incidentally, is in Hampshire; hopeful visitors have been known to journey to the other one, in Kent

DESTINATION FARNBOROUGH

Routes, Times and Prices for SBAC Show Visitors

ALL the world seems to go to Farnborough in September—or so it seems when one is trying to get away from the SBAC Show on one of the public days. This Hampshire town, location of the Royal Aircraft Establishment, becomes a Mecca for everyone interested in aviation—whether aircraft industry employees, technicians, spotters, members of the Services, airline representatives, Civil Servants or just enthusiasts.

What is the magnetism that attracts so many thousands to the Society of British Aircraft Constructors' annual flying display and exhibition? Partly its open-air setting; partly the splendid skill shown by the pilots; partly the wish to see what the British industry is producing (this goes especially for foreign visitors); partly the curiosity of one company to see what another is doing; partly the social atmosphere, meeting old friends (and rivals) convivially; and partly the wish for a jolly good day's outing.

This year's show begins next Monday, September 4, with the traditional Press and technicians' preview day; and the following three days, Tuesday to Thursday inclusive, are reserved for SBAC guests. Then come the public days: Friday, Saturday and Sunday, September 8, 9 and 10. All through the week the airfield gates open at ten in the morning and close at seven in the evening; but there is a half-hour variation in starting-time for the flying display: on the three public days this begins at 3 p.m.; on all other days at 2.30 p.m.

The road to Farnborough in early September is now almost as fabulous as the roads trodden by Bob Hope and Bing Crosby; but although (in a collective sense) the highway forms the most widely used means of getting to the show, it is not the only one. Guests of the SBAC may fly into RAF Odiham, whence the Society runs a special coach service to Farnborough airfield, operating on the private days and on Friday, first of the public days. It will commute as frequently as possible (e.g., at half-hourly intervals in the busy periods) and guests have only to show their badges or tickets.

For those travelling to Farnborough by train, special facilities are being provided by British Railways. The airfield is well situated near main lines, the Waterloo - Salisbury section passing through Farnborough station and a Waterloo - Portsmouth line via Ash Vale and Aldershot; in addition a route comes in from Reading and the Midlands to North Camp station. BR are providing through booking facilities from stations in the Southern Region, and special trains are being run from some centres in the other BR regions. Extra trains are being run between London and Farnborough and there are special road-rail cheap day tickets from London (11s return) and other stations to Farnborough and Aldershot. This is done through the co-operation of the Aldershot and District Traction Co Ltd, who arrange a shuttle service of buses from North Camp and Aldershot stations to points near the airfield. Alternatively, the whole journey may be made by Aldershot and District coach from London. Services leave Victoria Coach Station at 8.50 a.m., and thereafter hourly at fifty minutes past each hour, arriving at Farnborough Town Hall (a 250yd walk from the airfield) about an hour and thirty-five minutes later. The fares for this journey are 4s 9d (single), 6s 9d (day return) and 8s (period return).

Having mentioned the cost of coach fares, and the special combined road-rail ticket, it is appropriate to set out the admission costs to Farnborough on the public days. These have not changed from last year. They are higher on the Friday, the only day for which advance bookings may be made. On this day admission charges are 20s for adults and 10s for children under 14; parking costs 20s for cars or motor coaches, 5s for motor cycles and 2s 6d for pedal cycles, these payments covering parking only, all occupants of vehicles having to pay normal admission charges. Advance bookings can be made either with Auto-Parks Ltd (1 Maclise Road, London W14: SHEpherd's Bush 5385-6-7) or through the usual ticket agencies. Pay-at-the-gates is the form if no advance bookings are made.

Advance bookings cannot be made for Saturday and Sunday (September 9 and 10), when admission charges are 5s for adults, 2s 6d for children (under 14) and 30s for private cars with up to six occupants. If a car has more than six the extra passengers must pay normal admission charges. Parking fees for motor cycles and pedal cycles on the Saturday and Sunday are 2s 6d and 1s respectively; for motor coaches the fee is 10s, but in practice the parking-space is so taxed on these public days that coaches have to be parked outside the airfield—within easy walking distance, however, of one of the gates.

Many hundreds, if not thousands, of people will be driving their own cars and other vehicles to Farnborough. For their benefit we reproduce on this page a map of the main routes from all points of the compass: from the North, through Reading and down the A327; from London and the South-East, by Guildford and the A31 (Hog's Back), or from London an alternative route is the A30 to Bagshot and down the A325; from the Portsmouth area and the South Coast, up the A31 or A325 or A287; and from Basingstoke and the West, along the A30 and A287, then the A325 from Aldershot.

Both the motoring organizations, the Royal Automobile Club and the Automobile Association, are doing all they can to help road-users going to the show. Inside the airfield at Farnborough the RAC will have a mobile service unit, with Land-Rovers standing by, ready to go out in answer to emergency calls. It will also have an office, manned by "patrolettes" (as the RAC girls are called) and other staff; a radio link is being maintained with club vehicles patrolling the approach roads—on which, this year, they will have at least two extra offices; within a 25-mile radius special road-signs will direct drivers, and the RAC is co-operating with the police in putting up temporary signs for the diversion of traffic if necessary. Similarly, AA patrols will work closely with the Hampshire police; patrolmen in the airfield car-parks are again being equipped with walkie-talkie sets; breakdown vehicles are being stationed on all approach roads; and "Jumbo," one of the Association's big mobile offices, is once more on duty to maintain radio contact between AA men inside and outside the display.

Refreshment, solid and liquid, is obtainable in the airfield area, and other amenities include a post office, bookstalls and a generous provision of litter bins (in past years the clearance of litter has been one of the most formidable tasks in the restoration of the airfield for its normal use by the Royal Aircraft Establishment on the post-show Monday).

Footnote: Every year *Flight* is asked, by letter or telephone, "Are cameras permitted?" The answer is "yes."

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SHOW EXHIBITORS, STAND NUMBERS

Aircraft and Engines

	Stand
Alvis Ltd	H
Boulton Paul Aircraft Ltd	N
Bristol Siddeley Engines Ltd	E
British Aircraft Corporation Ltd	D
British Executive and General Aviation Ltd	G
Fairey Engineering Ltd	C
Handley Page Ltd	B
Hawker Siddeley Aviation Ltd	L
Ministry of Aviation	A
D. Napier & Son Ltd	M
Rolls-Royce Ltd	K
Scottish Aviation Ltd	F
Short Brothers & Harland Ltd	I
Westland Aircraft Ltd	J

Materials, Components, Equipment

	Stand
Accles & Pollock Ltd	129
Acton Bolt Ltd	247
Aero Controls Ltd	71
Aircraft Furnishings Ltd	279
Aircraft Materials Ltd	262
Airmed Ltd	145
Airscrew Co & Jicwood Ltd	200
Alcan Industries Ltd	189
Amalgamated Wireless (Australasia) Ltd	23
Amphenol-Borg Ltd	289
Amplivox Ltd	277
Associated Electrical Industries Ltd (Aircraft Equipment Group)	197
Associated Electrical Industries (Woolwich) Ltd	198
B. Attewell & Sons Ltd	98
Automotive Products Co Ltd	53
Avdel Ltd	243
Avery-Hardoll Ltd	255
Avica Equipment Ltd	280
B.B. Chemical Co Ltd	168
BP Trading Ltd	220
Bakelite Ltd	42
Baxter, Woodhouse & Taylor Ltd	95
Beaufort (Air-Sea) Equipment Ltd	162
Bell Precision Engineering Co Ltd	239
Bell's Asbestos & Engineering Ltd	36
Belling & Lee Ltd	268
Beme Telecommunications Ltd	80
Birmetals Ltd	178
Birmingham Aluminium Casting (1903) Co Ltd	204
James Booth Aluminium Ltd	232
Brent Chemical Products Ltd	263
Bristol Aerojet Ltd	282
Bristol Aeroplane Plastics Ltd	113
British Aircraft Corporation Ltd	293
British Aluminium Co Ltd	170
British Communications Corporation Ltd	163
British Ermeto Corporation Ltd	213
British Insulated Callender's Cables Ltd	201
British Manufactured Bearings Co Ltd	131
British Oxygen Co Ltd (Engineering Division)	210
British Oxygen Co Ltd (Operating Division)	212
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British Paints Ltd	215
Britten-Norman Ltd	88
Brown Bayley Steels Ltd	83
Brown Brothers (Aircraft) Ltd	203
S. G. Brown Ltd	85
Bryans Aeroquipment Ltd	90
Burgess Products Co Ltd	287
Burndept Ltd	84
Canadian Marconi Co	19
Cellon Ltd	202
Cementation (Muffelite) Ltd	169
Chesterfield Tube Co Ltd	270
J. S. Chinn & Co Ltd	276
Chloride Batteries Ltd	286
CIBA (A.R.L.) Ltd	114
E. K. Cole Ltd	193
Connolly Bros (Curriers) Ltd	18
Coopers Mechanical Joints Ltd	57
A. C. Cossor Ltd	240
Cossor Radar & Electronics Ltd	241
John Curran Ltd	195
Darchem Engineering Ltd	267
Decca Navigator Co Ltd	74
Decca Radar Ltd	75
Delaney Gallay Ltd	285
Desoutter Brothers Ltd	249
"Diamond H" Switches Ltd	140
Didsbury Engineering Co Ltd	116
Docker Brothers	250
Dowty Group Ltd	43-48
Dunlop Rubber Co Ltd	59
Dzus Fastener Europe Ltd	146
E.M.O. Instrumentation Ltd	110
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H. W. Edghill & Co Ltd	137
Ekco Electronics Ltd	194
Electro-Hydraulics Ltd	68
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Elliott Brothers (London) Ltd (Airborne Radio and Radar Division)	253
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English Electric Co Ltd (Aircraft Equipment Division)	295
English Steel Corporation Ltd	127
Esso Petroleum Co Ltd	66
Exactor Ltd	205
Export Packing Service Ltd	73
Fairey Aviation Co of Australia Pty Ltd	9
Fairey Aviation Co of Canada Ltd	10
Fairey Engineering Ltd	11
Ferranti Ltd	184
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Fibreglass Ltd	30
Field Aircraft Services Ltd	233
Fireproof Tanks Ltd	97
Firestone Tyre & Rubber Co Ltd	12
T. F. Firth & Sons Ltd	29
Thos. Firth & John Brown Ltd	234
Firth-Derihon Stampings Ltd	235
Firth-Vickers Stainless Steels Ltd	17
W. T. Flather Ltd	128
Flexible Ducting Ltd	281
Flight Equipment & Engineering Ltd	259
Flight Refuelling Ltd	245
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Fothergill & Harvey Ltd	256
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Godfrey Engineering Co Ltd	32
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Graviner Manufacturing Co Ltd	219
Grundy & Partners Ltd	258
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Hordern-Richmond Ltd	102
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Imperial Chemical Industries Ltd (Plastics Division)	135
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Jessop-Saville Ltd	38
K.L.G. Sparking Plugs Ltd	1
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Ketay Ltd	77
Walter Kidde & Co Ltd	171
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Lancefield Aircraft Components Ltd	176
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Lockheed Precision Products Ltd	54
Lodge Plugs Ltd	16
Joseph Lucas (Batteries) Ltd	105
Lucas Gas Turbine Equipment Ltd	103
Lucas-Rotax Ltd	104
Lucas-Rotax (Australia) Pty Ltd	125
M.L. Aviation Co Ltd	41
Magnesium Elektron Ltd	166
William Mallinson & Sons Ltd	107
Manchester Oil Refinery Ltd	133
Marconi Instruments Ltd	20
Marconi's Wireless Telegraph Co Ltd	21
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Marston Excelsior Ltd	136
Martin-Baker Aircraft Co Ltd	237
Metachemical Processes Ltd	144
Micanite & Insulators Co Ltd	199
Microcell Ltd	52
Mitchell Hydraulics Ltd	111
Mollart Engineering Co Ltd	79
Morfax Ltd	106
Murex Welding Processes Ltd	7
Murphy Radio Ltd	174
Negretti & Zambra Ltd	160
Louis Newmark Ltd	188
Newton Brothers (Derby) Ltd	154
Normalair Ltd	227
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Optical Measuring Tools Ltd	58
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Premier Precision Ltd	89
Pritchett & Gold and E.P.S. Co Ltd	244
R. B. Pullin & Co Ltd	126
Pye Ltd	187
Pyrene Co Ltd	55
R.F.D. Co Ltd	108
Rank Cintel Ltd	269
Rawlplug Co Ltd	155
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Redifon Ltd (Flight Simulator Division)	28
Rellumit (London) Ltd	119
Reynolds (Packaging) Ltd	40
Reynolds Tube Co Ltd	249
S. Grahame Ross Ltd	266
Rotax Ltd	126
Royston Industries Ltd	167
Rubery Owen & Co Ltd	67
L. A. Rumbold & Co Ltd	283
Salford Electrical Instruments Ltd	35
W. H. Sanders (Electronics) Ltd	134
Sangamo Weston Ltd	72
Saunders Valve Co Ltd	296
W. Bryan Savage Ltd	186
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Shell International Petroleum Co Ltd	222
Shell-Mex & B.P. Ltd	221
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Skyhi Ltd	275
Smart & Brown (Machine Tools) Ltd	181
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Smith's Stamping Works (Coventry) Ltd	39
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Southern Forge Ltd	196
Southern Instruments Ltd	251
SPE Co Ltd	274
George Spencer Moulton & Co Ltd	265
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Standard Telephones & Cables Ltd (Radio Division)	156
Standard Telephones & Cables Ltd (Rectifier Division)	157
Standard Telephones & Cables Ltd (Transmission Division)	158
Steel, Peech & Tozer Ltd	123
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J. Stone & Co (Charlton) Ltd	230
J. Stone & Co (Deptford) Ltd	231
Suntex Safety Glass Industries Ltd	101
Super Oil Seals & Gaskets Ltd	63
T.K.S. (Aircraft De-icing) Ltd	26
Taylor, Taylor & Hobson Ltd	264
Tecalemit Ltd	177
Technograph Electronic Products Ltd	173
Teddington Aircraft Controls Ltd	49
Teleflex Products Ltd	130
Thermal Control Co Ltd	183
Thermionic Products (Electronics) Ltd	290
Thorn Electrical Industries Ltd	115
Titanine Ltd	207
Triplex Safety Glass Co Ltd	13
Ronald Trist & Co Ltd	37
Tubes Ltd	260
George Tucker Eyelet Co Ltd	117
Tungum Co Ltd	261
Ultra Electronics Ltd	297
Unbrako Socket Screw Co Ltd	112
Vactric (Control Equipment) Ltd	86
Vactric (Precision Tools) Ltd	87
Venner Ltd	62
Venner Accumulators Ltd	61
W. S. Electronics (Production) Ltd	271
Ward, Brooke & Co Ltd	252
Waymouth Gauges and Instruments Ltd	4
Wellworthy Ltd	206
Western Manufacturing (Reading) Ltd	6
Westinghouse Brake & Signal Co Ltd	238
Westland Aircraft Ltd	226
Whitehouse Industries Ltd	242
Whiteley Electrical Radio Co Ltd	118
Henry Wiggin & Co Ltd	24
Williamson Manufacturing Co Ltd	99
Wilmot Breeden Ltd	141
Wilmot, Mansour & Co Ltd	81
Wireless Telephone Co Ltd	93
Zwicky Ltd	284

Equipment Park

	Covered Stand	Open Site
Airtech Ltd	—	X
Sir W. G. Armstrong Whitworth Aircraft Ltd	—	PI
Associated Electrical Industries Ltd	—	L
Auto-Diesels Ltd	3	W
Automotive Products Co Ltd	—	N
Blackburn Engines Ltd	8	T
British Oxygen Co Ltd	11	H
Brown Brothers (Aircraft) Ltd	7	—
David Brown Industries Ltd	—	D
A. C. Cossor Ltd	16	—
Delaney Gallay Ltd	6	—
Dexion Ltd	13	E
Export Packing Service Ltd	—	P
Flight Refuelling Ltd	4	—
Gloster Aircraft Co Ltd	8	S
H.M.L. (Engineering) Ltd	1	Y
Houchin Ltd	17	A
Lucas Gas Turbine Equipment Ltd	15	B
Lucas-Rotax Ltd	15	B
M. L. Aviation Ltd	—	G
Marconi Instruments Ltd	—	C
Marston Excelsior, Ltd	—	V
Microcell Ltd	12	EI
Ministry of Aviation	2	—
Morfax Ltd	—	U
Murex Welding Processes Ltd	—	I
The Pyrene Co Ltd	—	F
Rellumit (London) Ltd	—	J
Rotax Ltd	15	B
Rover Gas Turbines Ltd	14	—
Short Brothers & Harland Ltd	—	O
Spurling Motor Bodies Ltd	10	M
L. M. Van Moppes & Sons (Diamond Tools) Ltd	5	—
W. Vinten Ltd	9	R
Zwicky Ltd	—	Q

THE MoA AT FARNBOROUGH

AT the Farnborough Show each year the Ministry of Aviation stages exhibits which for interest rival those of any of the commercial participants. These exhibits will be in four areas—in the main hall and in the radar, guided-weapons and equipment parks—and the Ministry has issued the following information about them. Many of the facts, notably those concerning Blue Streak, have already appeared in *Flight*, but the MoA notes—here slightly abbreviated—provide a useful summary.

Exhibition Hall The Royal Aircraft Establishment has undertaken a considerable amount of work on space research, falling broadly under the following headings: (a) assistance in the preparation of the proposals for a European satellite launcher organization and a European space research organization; (b) satellite studies under the Royal Society (British National Committee on Space Research) and (c) work on sounding rockets, e.g., the Skylark programme.

European Satellite Launcher. Under the Anglo-French proposals for the development of a three-stage satellite launcher Britain would provide Blue Streak as the first stage, France would contribute the second stage, and the third stage would be developed elsewhere.

A model will be displayed on the Ministry's main stand giving an idea of what a three-stage rocket based on Blue Streak might look like. The first and second stages, provided by Britain and France respectively, will be shown. The full height at launch will be 100ft and Blue Streak has a diameter of 10ft. This three-stage rocket could put a one-ton satellite into a circular orbit 300 miles above the earth.

Safety in the Air. The present UK airways system, radar coverage, and navigation aids will be shown, and parts of the MoA display will illustrate how a flight is made.

Problems of air traffic control which must be faced in the future include not only increased density of traffic but higher speeds and greater heights. Descriptions will be given of plans for future radar coverage, research on future traffic patterns, application of computer techniques to air traffic control and new navigational aids.

The Head-up technique will be demonstrated by the RAE. This is an entirely new method of instrument flying. An optical device is used to give steering instructions to the pilot without there being any need for him to divert his attention from the outside world. Among its advantages are that it greatly increases safety from collision, permits more efficient use of airspace and eases the pilot's task.

Also demonstrated will be the Moving Map, an experimental method of presenting information to a pilot. Basic maps are projected from 35mm film and the aircraft position is shown by a moving spot on the screen.

Radar Park Air traffic control is under constant and critical examination with the aim of applying a continuous programme of improvements through the introduction of new aids and the adoption of new procedures and organizations. The Ministry's Air Traffic Control Experimental Unit plays a prominent part in this work by helping to define the problems and determine how best to solve them. This is done by means of operational research, equipment evaluation, and systems study and test.

A demonstration will show the method by which traffic-control problems are simulated, and in the associated exhibition examples will be given of the results of the ATCEU's work—for instance, in improving the traffic-control system at Southend.

In the course of these studies simulated aircraft are "piloted" by housewives and others who have found this interesting and unusual part-time work. These aircraft can be freely navigated within an area of 160,000 square miles at speeds of up to 600kt. Headings can be changed at up to rate 2, and indications of rates of climb and descent of up to 4,000ft/min are provided. The dynamic simulator can generate up to 15 radar echoes, as seen from two separate types of radar operating from the same site.

Associated with the simulation equipment, an industrial television network is used as a means of relaying and displaying flight data at control positions. The operations room is fully equipped with radar consoles, procedural or planning positions, simulated radio telephony and an internal telephone network. This provides a realistic environment in which controllers can test out new equipment and procedures in perfect safety.

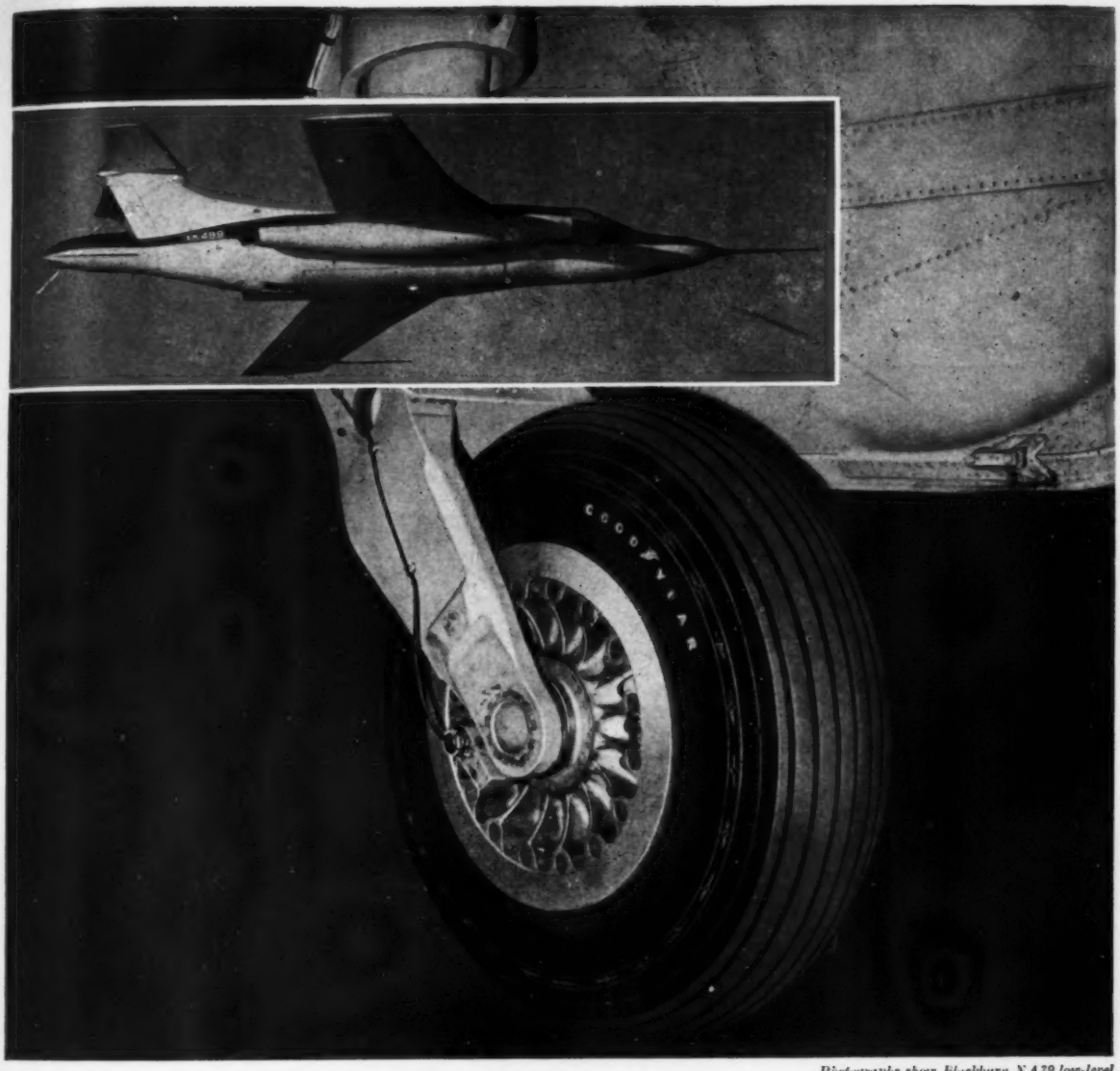
Guided Weapons Park Here will be seen Jaguar, a three-stage test rocket designed jointly by the Weapons Research Establishment and the RAE. Its primary rôle is the investigation of basic aerodynamic problems at speeds of up to two miles per second. Extreme simplicity of construction and operation has been achieved by using solid-fuel motors in all three stages. The first stage boosts the vehicle to an altitude of 80,000ft. When a near-horizontal flight-path has been attained the second stage is fired by radio control from the ground; the third stage fires automatically immediately the second burns out.

Equipment Park A rocket-launched free-flight model aircraft in the Apollo series will be contributed by RAE Farnborough. The model is usually launched at a speed of nearly 1,200 m.p.h. at low altitude, and data on drag, dynamic stability and aerodynamic heating is relayed to the ground by means of radio-telemetry equipment.

The National Gas Turbine Establishment, Pyestock, will be demonstrating their spinning disc fuel atomizer developed for measuring the thickness of a moving liquid film. Of the two working exhibits, one will show stroboscopic lighting "stopping" the flow of a liquid across the face of a spinning disc.

There will also be on show a scale model of a radar now being built at the Royal Radar Establishment. Equipped with a 45ft-diameter dish, it will have the accuracy and speed of movement necessary for tracking artificial satellites, and represents a type of equipment that may be used in the near future in long-distance communications satellite work.

The Rocket Propulsion Establishment, Westcott, will be showing a static exhibit in the form of a powerful 3ft-diameter solid-propellant rocket motor. Two colour-films will illustrate the static firing of a research motor fitted with a swivelling nozzle and also the burning of a solid propellant charge seen through a high-pressure window in the head of a 5in-diameter rocket motor.



Photographs show Blackburn NA39 low-level strike aircraft, and close-up of wheel assembly. By courtesy of Blackburn Aircraft Limited.

Blackburn NA39's will come in on Goodyear

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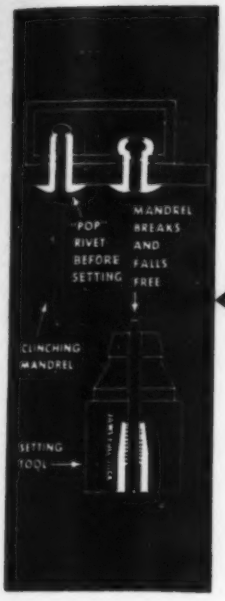

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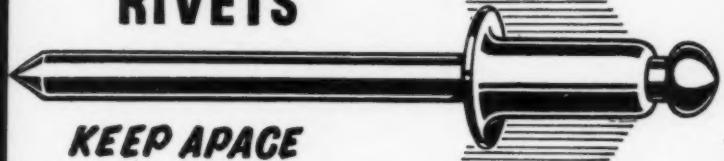

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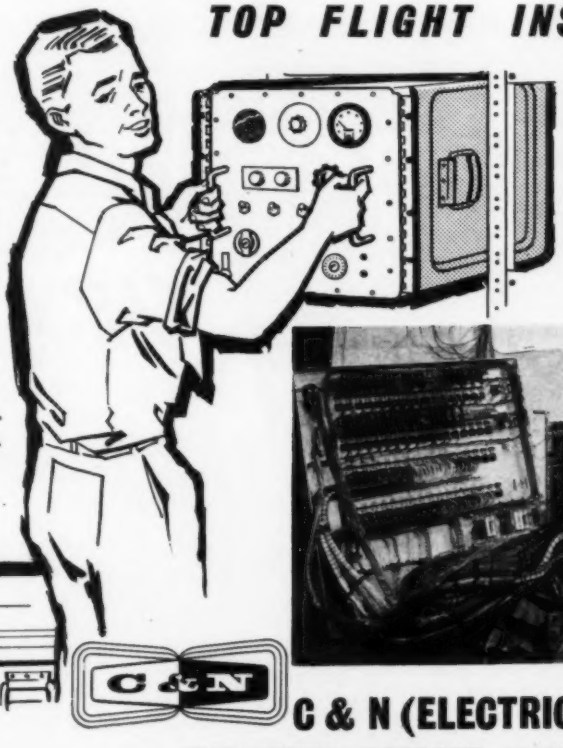

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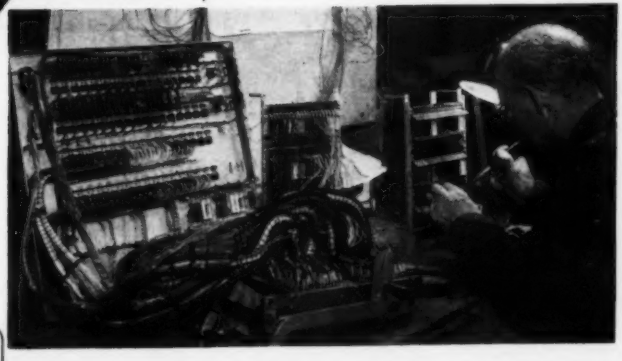

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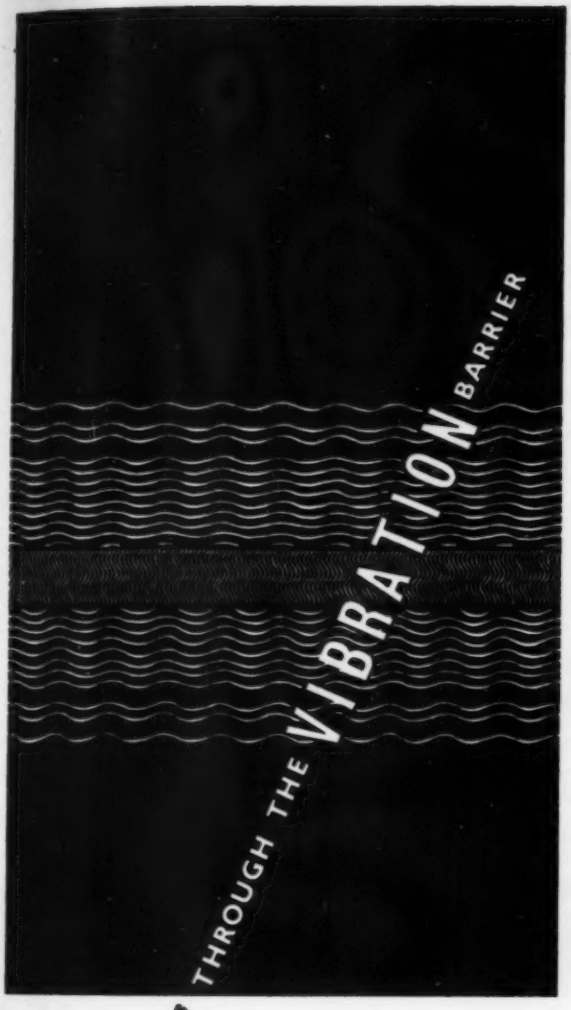

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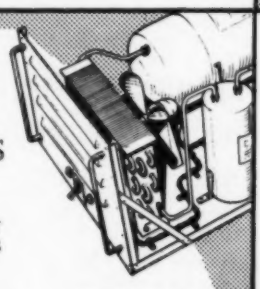

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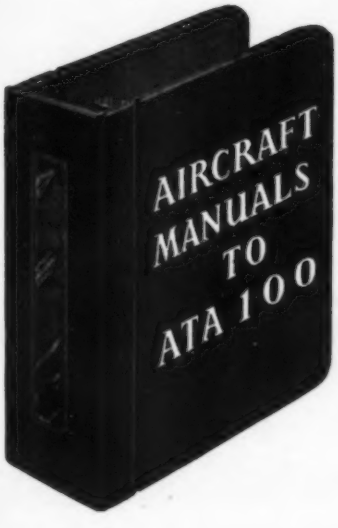

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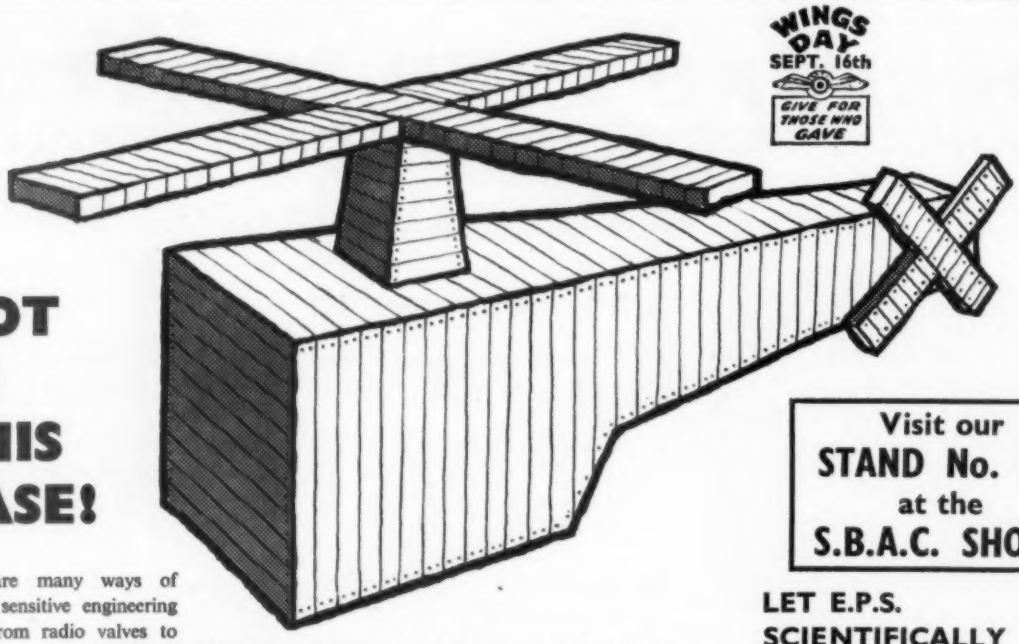

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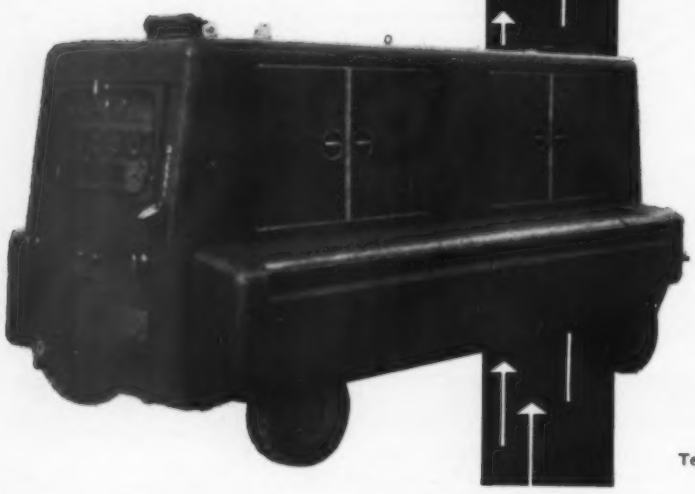

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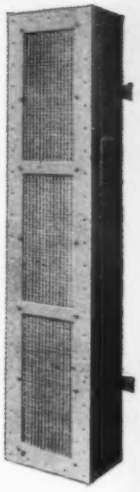

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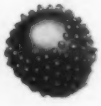

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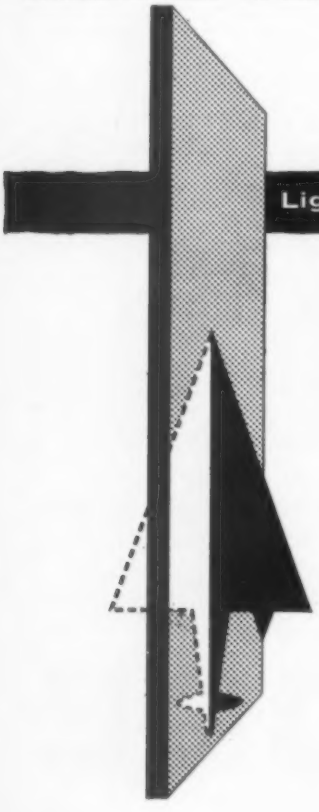

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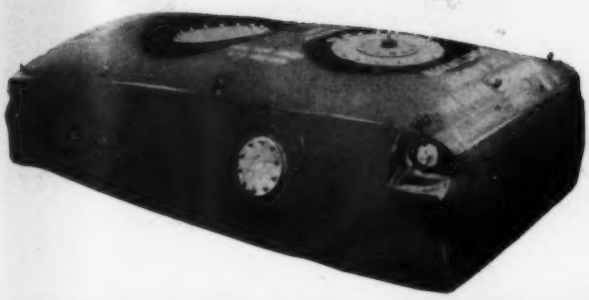

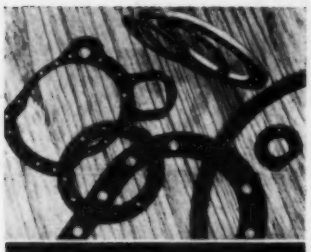

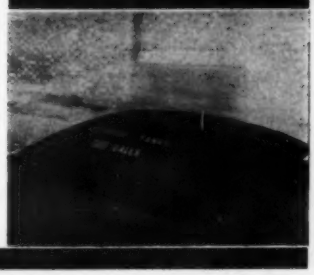

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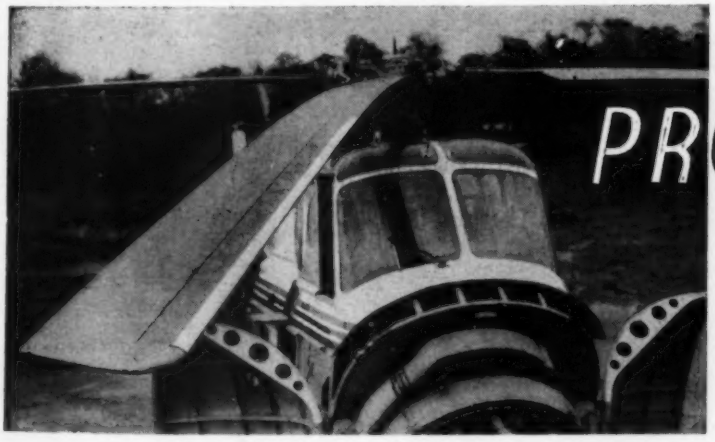

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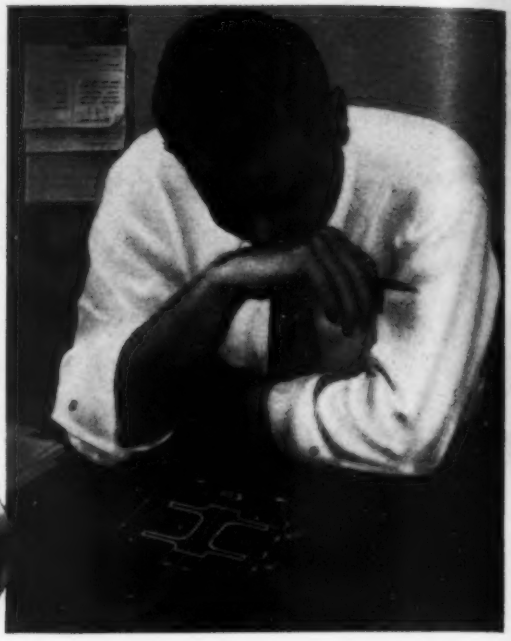
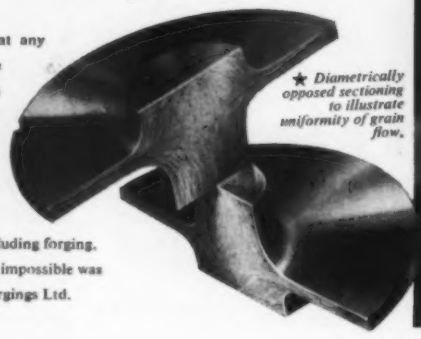


The problem here was that any machining likely to interfere with the generation of grain flow through the central barrel to the periphery had to be eliminated. It looked impossible, everything appeared to be against its manufacture, including forging, but as always the seemingly impossible was achieved by Light-Metal Forgings Ltd.



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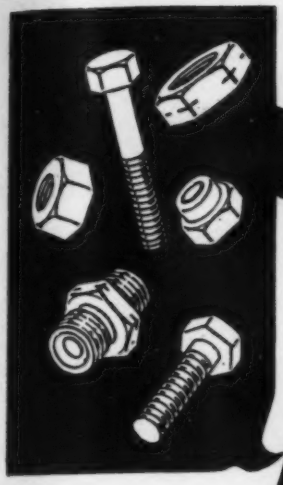

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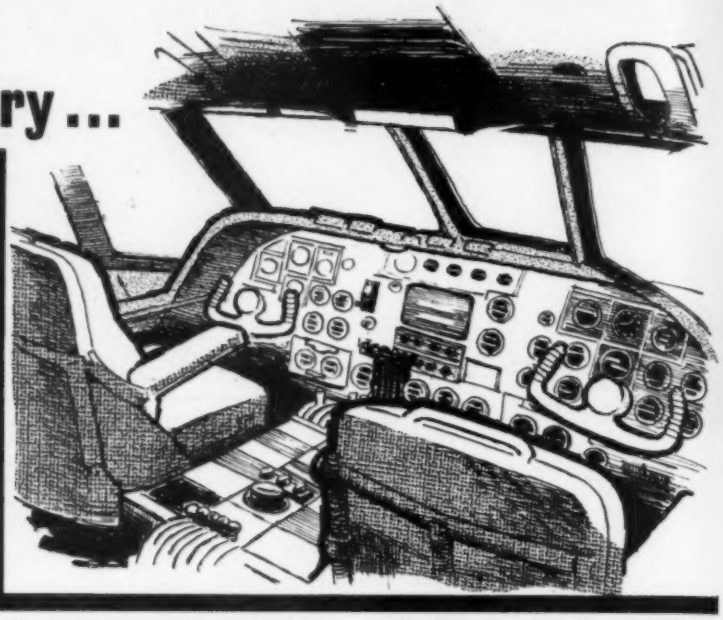

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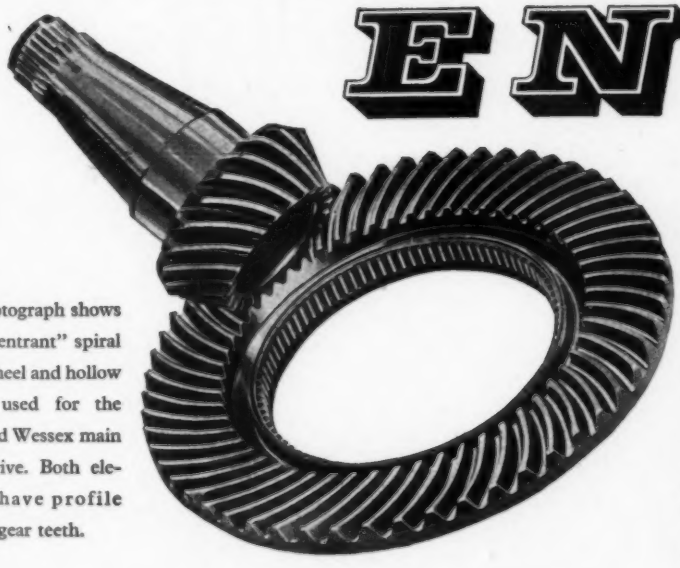

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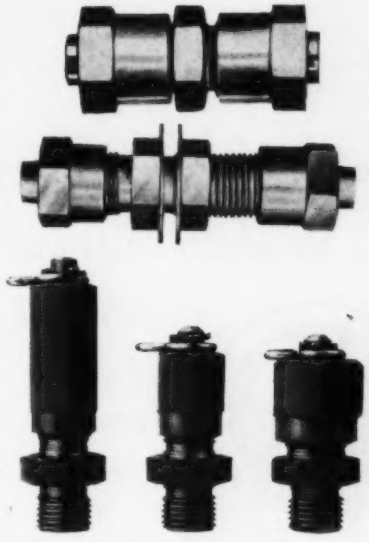

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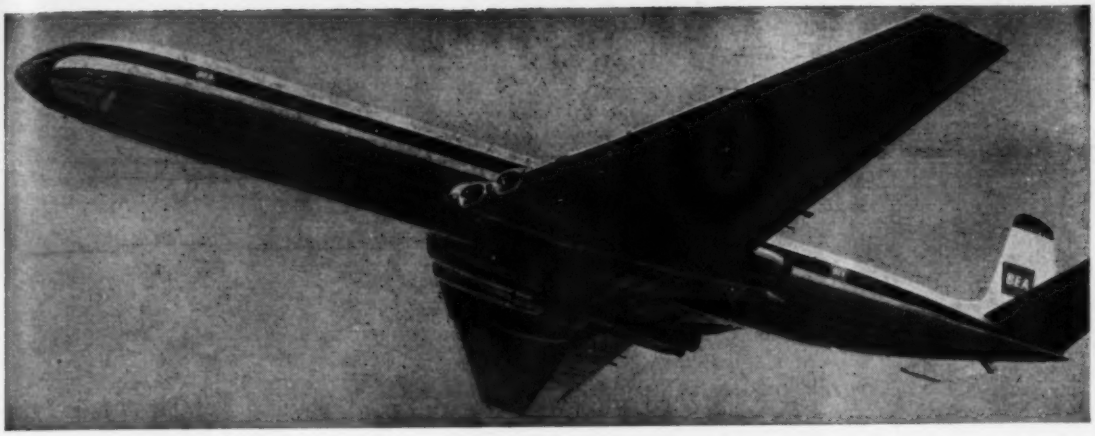

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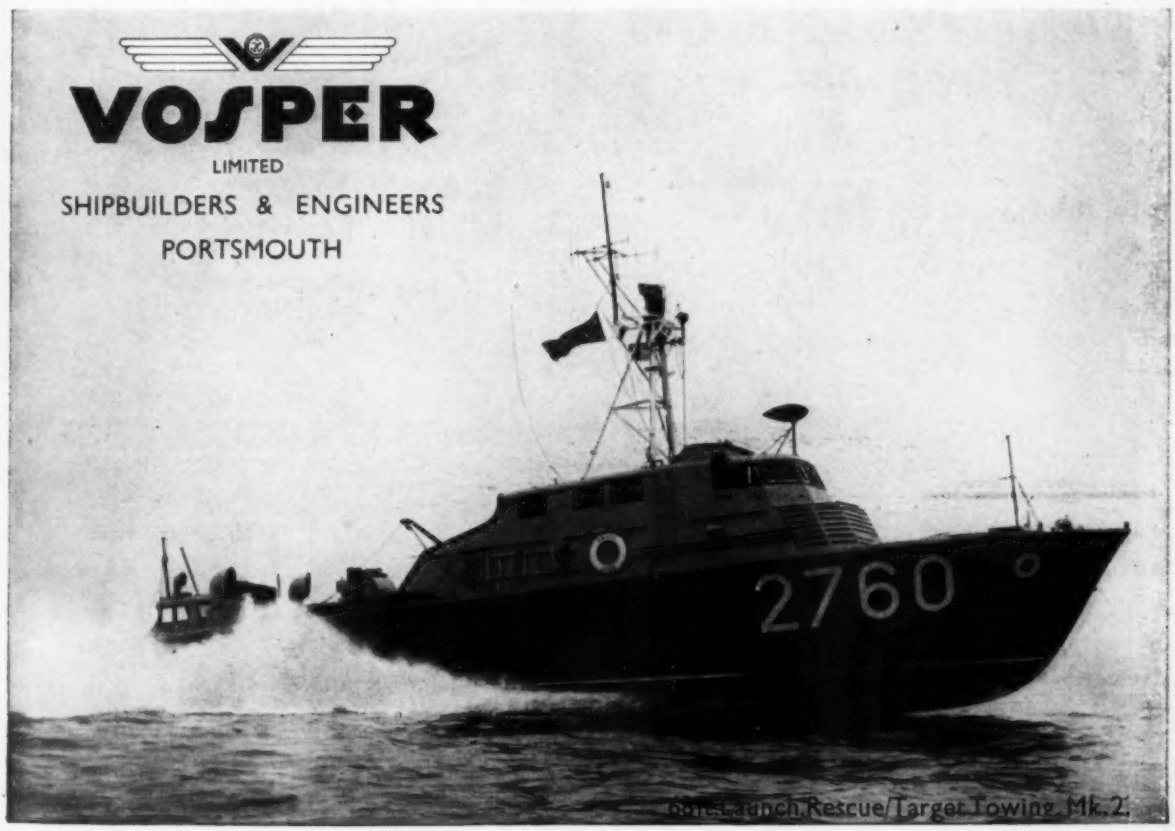

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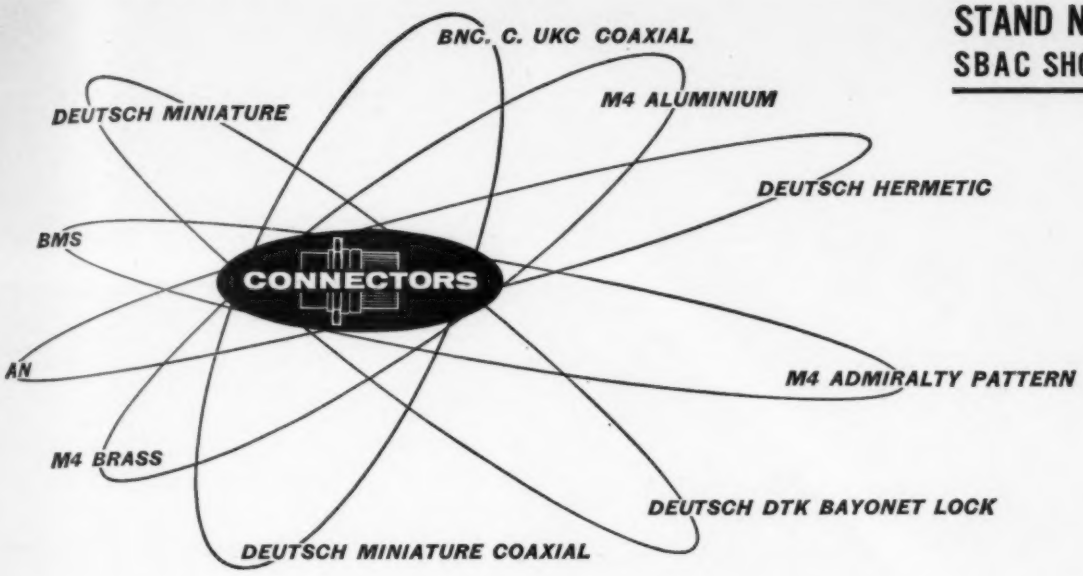

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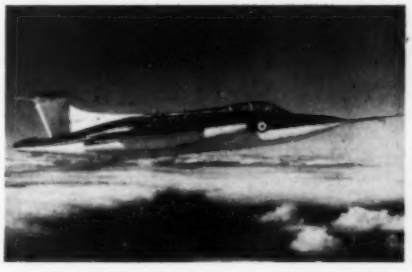

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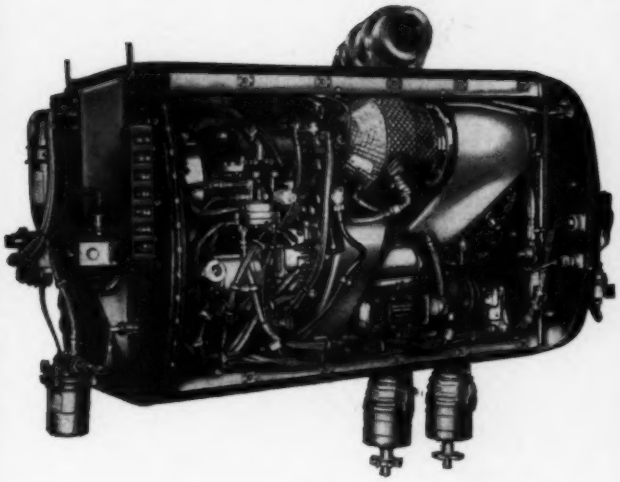

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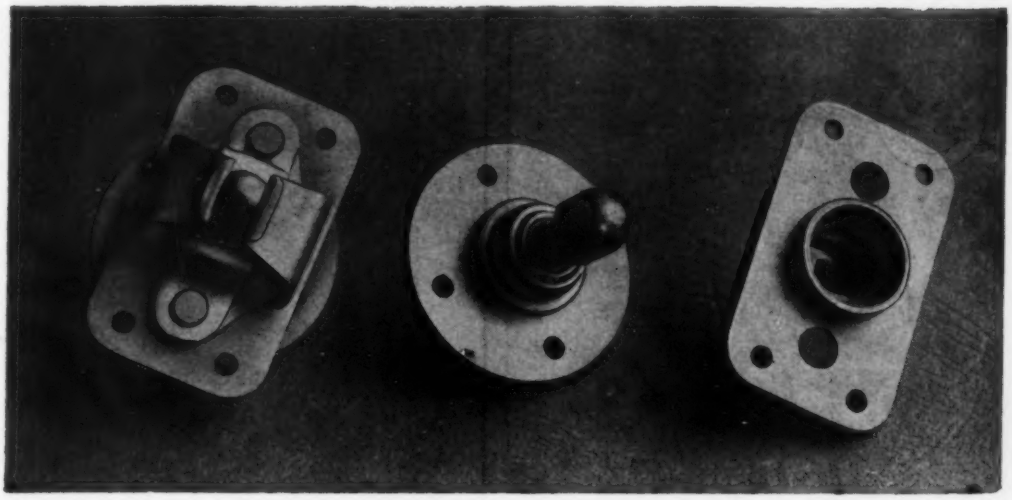

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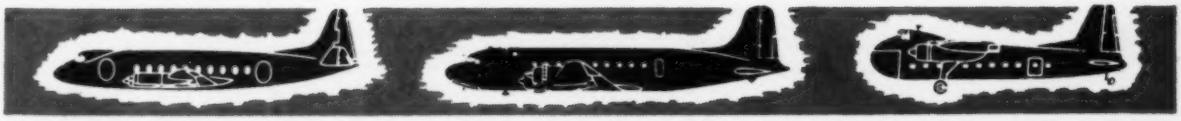

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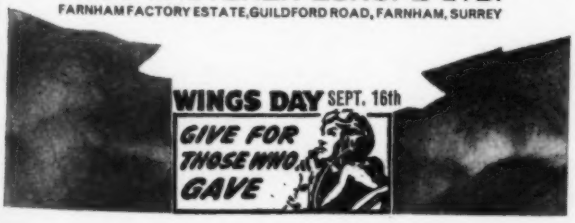

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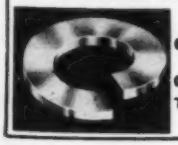

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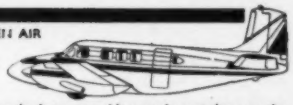

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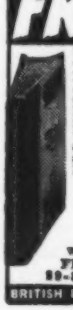

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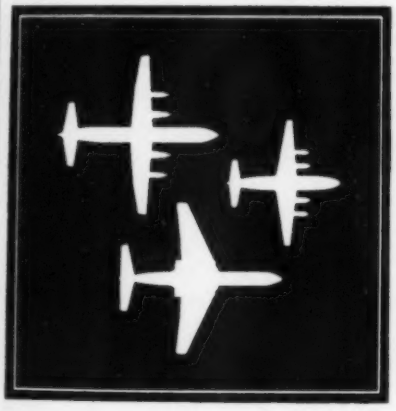

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